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# NOTE-BOOK

OF

# MATERIA MEDICA,

PHARMACOLOGY AND THERAPEUTICS.

# NOTE-BOOK

OF

# MATERIA MEDICA,

## PHARMACOLOGY AND THERAPEUTICS.

BY

**R. E. SCORESBY-JACKSON, M.D., F.R.S.E.,**

ETC., ETC., ETC.

*Fourth Edition,*

REVISED AND BROUGHT DOWN TO THE PRESENT DATE,

BY

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Dedicated,

BY PERMISSION,

TO

SIR ROBERT CHRISTISON, BART., M.D., V.P.R.S.E.,

PROFESSOR OF MATERIA MEDICA IN THE UNIVERSITY OF EDINBURGH, ETC.,

WITH EVERY SENTIMENT OF RESPECT AND ESTEEM,

BY HIS FORMER PUPIL,

THE AUTHOR.

# PREFACE TO THE FIRST EDITION.

IN order to relieve the Students attending my lectures as much as possible from the irksomeness of note-taking, I prepared, two years ago, a pamphlet containing all the formulæ, the weights and measures, &c., of the British Pharmacopœia, printed it, and offered it for their acceptance. I found that this *Note-Book of Formulæ*, as it was called, was of some use, and I hoped to have made it still more so by enlarging it a little before presenting a second edition. Just as I was about to do so, however, I received a communication from the Publishers of this book, asking me to place in their hands what I thought would be useful to the Student of Materia Medica.

In responding to their request, I have endeavoured to prepare a work which will relieve the Student from much of the mechanical labour of note-taking, and which, whilst it supplies a good deal of useful information, will suggest the necessity of a more complete investigation of the subject.

In preparing the book for press, I have considerably exceeded the limits of my first intention; so difficult is it to keep back what we desire that others should participate in. But still it is only a *Note-Book*, and its aim is to be suggestive rather than dogmatic.

All quotations from the Pharmacopœia are made in italics. The names of officinal drugs are printed in bolder type, and may thus be distinguished from others which are not officinal. The officinal drugs, preparations, and compounds, are distinguished *in the index by an* asterisk.

I have to express my thanks to many kind friends who have advised me upon various points during the progress of the work —especially to Professor Balfour, whose *Class-Book of Botany* I have followed in the arrangement of the Natural Orders; to Dr. Sellar, Examiner in Medicine in the University of Edinburgh; to my colleague, Dr. Stevenson Macadam, Lecturer on Chemistry; and to Mr. J. B. Stephenson, Pharmaceutical Chemist.

32 Queen Street, Edinburgh,
*May*, 1866.

# PREFACE TO THE SECOND EDITION.

In preparing a new Edition of the "Note-Book," the Editor, in accordance with the wishes of the relatives of Dr. Scoresby-Jackson, has strictly adhered to the original plan of the work. All the new preparations introduced into the British Pharmacopœia of 1867 are included in the present Edition.

The whole work has been subjected to a rigid revisal; many of the articles, such as Bromide of Potassium, Sulphurous Acid, the Subnitrate of Bismuth, Arsenious Acid, Conium, Digitalis, &c., have been almost entirely rewritten; whilst several additions have been made, such as the Solution of Bismuth, the Hydrate of Chloral, Carbolic Acid, &c. As the book is principally intended for Students accustomed to the new notation only, the formulæ employed in explanation of chemical reactions have been converted into this system throughout. To facilitate reference to older works, the constitution in symbols of substances possessed of definite chemical composition has been generally given, along with their names, in the old as well as the new notation. Now that the new system is used exclusively by Teachers of Chemistry, it seemed on the whole unnecessary to adopt a separate type for each notation, as is done in the British Pharmacopœia.

Every precaution has been taken to render the work as useful, accurate, and complete a Student's Text-Book as possible, and worthy of a continuance of that popularity it has already attained.

41 Northumberland Street,
Edinburgh, *Dec.*, 1870.

# PREFACE TO THE THIRD EDITION.

THE present Edition of the "Note-Book" is mainly a reprint of the last, with the addition of the new officinal preparations contained in the Supplement to the British Pharmacopœia. The whole work has, however, been again carefully gone over, and such alterations and additions made as the progress of Materia Medica and Therapeutics seemed to require. The Editor has to acknowledge his obligations to Dr. Henry, University Assistant to Sir Robert Christison, for valuable aid in revising the work.

The rapid sale of two large Editions, whilst it proves that the work supplies a real want as a Student's Text-Book, at the same time gives good reason to anticipate similar success for the present issue.

29 CHARLOTTE SQUARE,
EDINBURGH, *December*, 1874.

# PREFACE TO THE FOURTH EDITION.

In preparing the Fourth Edition of the "Note-Book" it has been found necessary to alter the original text in many places, in consequence of the progress which the Science of Therapeutics has made since the date of the last edition. The Editor has considered it advisable to retain the botanical descriptions of such plants only as are indigenous. This and other changes have been made solely with a view of not over-burdening the Student, or abstracting his attention from the study of the actions and uses of the drugs.

It is hoped, that by these efforts, the new edition will serve to maintain, if not to increase the popularity which the work has hitherto enjoyed as a Text-Book for Students of Materia Medica.

13 Alva Street,
Edinburgh, *October*, 1880.

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# NOTE-BOOK

OF

# MATERIA MEDICA, PHARMACOLOGY, AND THERAPEUTICS.

## PART I.—INTRODUCTORY.

**MATERIA MEDICA.**—This term, in its most restricted sense, signifies nothing more than the medicinal substances used in the cure of disease, and hardly extends beyond the domain of the druggist; but in a more liberal view, it embraces all the means at our disposal for the alleviation of the sufferings which attend disease —except those involved in pure Surgery and Midwifery—and includes all those *Hygienic* appliances which of late years have been so rapidly developed.

There is no law to define rigidly the scope and arrangement of a course of lectures on Materia Medica, and therefore, to a certain extent, the teacher is left to frame a plan according to his own idea of the relative importance of the various branches of his subject. The ultimate object of lectures on Materia Medica is to teach the legitimate use of means to an end. The centre around which the lectures are grouped is the *Physician's prescription.* From the utmost verge of the subject, the thread upon which it hangs leads back to the prescription, not of drugs only, but of everything that can alleviate suffering and cure disease. The ultimate object of medical education is to teach *how to write a prescription,* and in that little act lies the severest test of a physician's attainments. To be examined upon a prescription is to give access to every department of medical learning. If the student could satisfactorily explain the *how, what, when,* and *why* of prescribing, his education would be complete; but this is not to be attained during his *curriculum* merely, it is what the practitioner is still learning at the close of his career. The practical application of all the medical sciences culminates in the prescription; the ultimate object of Chemistry, Botany, Physiology, Pathology, and the other allied sciences, with respect to medicine, is to teach the physician how to apply the remedies at his disposal most advantageously to his patients.

Materia Medica is, as it were, surrounded by the medical sciences, so that in whatever direction we may advance we shall find ourselves approaching towards one or other of them. How far we may go without trenching upon the functions of another department, it is not easy to say. Attempts have been made to limit Materia Medica, and certain expressions have been coined to give it a locality. Such are—

*Acology* (ἄκος, *a remedy*, and λόγος) and *Iamatologia* (ἴαμα, *a remedy*, and λόγος), terms which signify *a discourse on remedies*. Acology has been limited by some authors to the consideration of those mechanical remedies, which, pertaining rather to pure surgery, it is not our province to deal with.

*Therapeutics* (θεραπεύω, *I cure*) relates to the application of Materia Medica, and varies in the extent of its signification according to the limits put upon the latter expression. It is divided into *General Therapeutics* and *Special Therapeutics*.

*Iatreusologia* (ἰατρεύω, *I cure*, and λόγος) signifies a discourse on the art of curing, a term applied by Sprengel to General Therapeutics.

*Dietetics* (δίαιτα, *diet*) is a term relating, in a restricted sense, to treatment by *alimentary substances*, but in a wider meaning, it is synonymous with *Hygiene* (ὑγιαίνω, *I am well*), a term relating to that department of medicine which treats of the restoration and preservation of health by means not strictly pharmacological. The agencies used in this department are the six *non-naturals* of the ancients, *air*, *aliment*, *exercise*, *excretion*, *sleep*, and *affections of the mind*. The term *Regimen* (*rego*, *I rule*) is included in this department.

*Pharmacology* (φάρμακον, *a medicine*, and λόγος) signifies a discourse on medicines, or Materia Medica. It is divided into *General Pharmacology* and *Special Pharmacology*, and is subdivided into *Pharmacognosy*, *Pharmacy*, and *Pharmacodynamics*.

*Pharmacognosy* (φάρμακον, *a medicine*, and γιγνώσκω, *I know*) and *Pharmacy* (φάρμακον, *a medicine*) are terms relating to the circumstances which affect the condition of simple and compound medicines during their passage from a state of nature to the physician's hand—viz., their source, collection, preservation, characters, qualities, purity, preparation, &c. The following terms are sometimes used synonymously—*pharmacography*, *pharmacomathy*, *pharmacotechny*, *pharmaconomia*, &c.

*Pharmacodynamics* (φάρμακον, *a medicine*, and δύναμις, *power*) relates to the actions and uses of medicines.

**Sources and Natural Condition of Medicines.**—Medicines are derived both from the organic and inorganic kingdoms, from animals, vegetables, and minerals. Besides these we use certain subtile imponderable agents, such as electricity, galvanism, heat, cold, and the like. Medicines are called *simple* when used individually, *compound* when two or more are incorporated. But many simple remedies are constituted of several active ingredients, any one of which, when isolated, is capable of producing a distinct medicinal effect. Take *opium* as an example of an individual remedy in one sense, but truly a very complex substance compounded in the laboratory of nature. The ponderable substances, except mineral waters, are rarely met with in a condition ready for use. They usually require certain operations to be performed upon them in order to fit or preserve them for medicinal application. These changes are wrought upon them by the pharmaceutist.

**The Selection and Collection of Medicines.**—In selecting medicines from the mineral kingdom, we must be careful to understand and thoroughly examine their qualities, and obtain them as pure as possible. Beyond this we have no general rules to guide us.

Medicinal plants are collected from either wild or cultivated sources. Comparatively few are produced in this country, the rest are imported. Wild plants are collected from their respective haunts by men known as *Simplers*, between whom and the profession is the middle-man, drug-merchant, herbalist, or pharmacopolist. *Simplers* are of ancient date; they are the representatives of the *Rhizotomi* of the Greeks, and *Herbarii* of the Romans. Cultivated plants are grown in various parts of the world, the chief medicine-growing districts of this country being at Mitcham in Surrey, and Hitchin in Hertfordshire. The medicinal plants cultivated at Mitcham are chiefly lavender, peppermint, chamomiles, roses, liquorice, and henbane. Also large quantities of poppies, rosemary, squirting-cucumber, belladonna, and pennyroyal; and in smaller quantities, spearmint, marshmallow, horehound, foxglove, stramonium, &c. At Hitchin the cultivation is at present chiefly restricted to lavender, elaterium, belladonna, henbane, and aconite. The distribution and cultivation of medicinal plants, as indeed of all plants, are restricted by natural laws, which are explained in works on botanical geography. But we are interested in this matter in a double point of view. It is not enough for us to know that a medicinal plant will grow in a foreign land, and present the same external characters as it does in its native soil, we must know also that its medicinal properties are alike under both conditions. Another question of importance is whether a plant that is medicinal in its wild state will preserve the same properties under cultivation; whether it is affected, medicinally, by the elevation at which it is grown, by its exposure more or less to light, by the kind of soil in which it is planted; whether it has the same medicinal value at all ages and at all seasons. In short, what is the effect of climate, soil, season, and cultivation upon medicinal plants? We have not much information to give in reply to this question. Much that has been stated in reference to it is vague and uncertain, and it is not easy to discriminate between the effects of one and another of these agencies.

We shall consider, 1. *The natural condition of a plant; 2. How the plant may be affected by a change in its circumstances; 3. Examples quoted as evidences of the influence of such change of circumstances.*

1. *The natural condition of a plant.* Plants are composed of *organic* and *inorganic* constituents. The *organic* constituents are common to all plants, and are four in number, Carbon, Hydrogen, Nitrogen, and Oxygen; in some cases, two more are added, Sulphur and Phosphorus, which enter into the composition of the sanguigenous elements in alimentary vegetables. The organic constituents largely preponderate in the constitution of plants; they are consumed when the plant is burned, and are decomposed by the united action of warmth and moisture. The *inorganic* constituents are comparatively small in quantity, are indestructible by heat, and do not undergo the process of putrefaction. They are not *universal—i.e.*, common to all plants —although some of them are widely distributed. They are more numerous than the organic constituents; they are Calcium, Magnesium, Potassium, Sodium, Iron, Manganese, Chlorine, Iodine, Bromine, Fluorine, Silicon, Sulphur, and Phosphorus. They vary in number and relative proportions in different plants, and do not exist in their elementary form, but are taken up as soluble sulphates, phosphates, chlorides, carbonates, silicates, &c., dissolved in water. Though small in quantity, they are essential to the building up of the tissues of the plant.

A few sentences must suffice to explain the nourishment and growth of plants, following a dicotyledonous example. After the dormant period of winter has passed, the tender fibres of the roots begin the process of vegetation, by absorbing from the soil a supply of aqueous fluid containing both organic and inorganic constituents; and in the performance of this function they are endowed with the power of selection. As the process continues, this fluid passes through the stronger parts of the root to the stem, which it mounts by the softer external part, called *alburnum* or *sap-wood*. When the plant is in full vegetation there is a constant current or circulation of the fluid from the roots, where it is absorbed, to the leaves, where it is altered in character. In its ascent from the root to the leaves, the fluid consists of little more than a thin watery solution of the inorganic constituents, with some mucilaginous and saccharine matters dissolved from the plant in its progress, and is called *crude sap*. When this sap has arrived at the leaves or other green parts of the plant, it is exposed to the action of new agencies, namely, the atmosphere, heat, and light; and it undergoes an important change.—1. In losing a large portion of its water by *transpiration* or *exhalation*; 2. In the absorption and decomposition of carbonic acid gas, by what is called *respiration*, and by which the carbon is provided to the plant; and 3. In the formation of certain organic products and secretions (including medicinal principles) by the process of *assimilation*. After these changes have taken place the fluid is called *elaborated sap*. When the sap is duly elaborated, it commences a downward course, along the *inner bark* or *cambium*, towards the root, adding new structures to the plant, and depositing its secretions in its course.

Such is a mere outline of the life of a dicotyledonous plant; but it is sufficient to suggest to us the modifications which medicinal plants may undergo according to the circumstances of their growth, namely,

2. *How the plant may be affected by a change in its circumstances.* —*a.* There are certain constituents of a plant that are essential to its existence, without which it cannot thrive, and the absence of which is marked by the unhealthy appearance of the plant. There are other constituents that are always present under favourable circumstances, but which may be entirely absent without causing any external indication of the deficiency. Amongst the latter are medicinal principles. A plant which possesses medicinal properties when grown in one locality, may grow even more luxuriantly in another, and yet be deprived of its medicinal virtues—a change only to be recognised by analysis or by experimental application.

*b.* Many fruits and vegetables esteemed in our time have been gained by cultivation from repulsive ancestors, and saccharine and amylaceous principles have been developed in them, to the exclusion of their former sour and bitter ingredients. Hence fruits and vegetables are rendered more agreeable and nutrient by cultivation. But the medicinal principles of plants are often characterised by a bitter or other disagreeable taste, and sometimes by an offensive odour; and if the effect of cultivation be to alter these characters, it is probable that the medicinal virtue of the plant will also be modified to a corresponding degree. Hence, by analogy, we might infer that cultivated plants may be inferior to wild plants for medicinal purposes. But since long experience has taught the fruit and vegetable gardener how to improve his produce, it is probable that continued observation by our intelligent medicine cultivators will enable them to overcome whatever obstacles at present beset their path, to which end they will be stimulated by the measure of success that has already attended their meritorious efforts.

*c.* The soil in which medicinal plants are cultivated must contain the constituents essential to the building up of the plant and to the formation of its active medicinal principles. The absent constituents are to be supplied by manures, an operation demanding considerable scientific and practical acquirements, and great caution. For it is not only the deficiency of certain ingredients in the soil that interferes with the virtue of medicinal plants, the selective power of the plant itself also exercises an important influence. A medicine may be inert because of the plant having been deprived of some of its important constituents; but the loss of activity may also result from the plant having been too richly supplied with a certain kind of aliment which it selected in great abundance, to the neglect or exclusion of other essentials.

*d.* The climate must be suited to the habits of the plant, a circumstance over which the cultivator has no control. The two more important elements are temperature and light, which cannot be supplied together by artificial means. Exotics may be placed in hothouses whose temperature is equal to that of their native land; but the quantity and intensity of the light, and the corresponding solar influence of tropical regions, can never be reproduced in this country, and it is to them that the elaboration of the sap and the simultaneous formation of active secretions are chiefly due.

*e.* The age of the plant and the season at which it is collected affect its active properties. Medicinal plants are to be gathered when they are in full vigour. Until perennial plants have attained a certain age they have not laid up a sufficient store of active principles to make it worth while to destroy them; they are allowed to come to full vigour, but not to pass on to decay. Annuals are collected also in the vigour of life. The part of the plant to be used, as the leaf, the root, the bark, the fruit, the seed, determines the time of collection.

*Roots* may be gathered either in autumn or spring, before the development of the leaf, or after the ripening of the fruit. According to Dr. Houlton, they should be taken up at the time that their leaves die, when they abound with the proper secretions of the plant. To this rule he allows no exception, but applies it equally to the roots of trees, shrubs, herbs, root-stocks, bulbs, cormi, and tubers. Biennial roots are to be gathered in their first year, as it is too late to collect them after the fall of the leaf in the second year, for by that time they are either dried up or decayed. Roots that are to be preserved should be dried immediately after they are collected. Large roots, especially the more juicy, dry spontaneously more readily in their entire state than when sliced, and their juices are then not exposed to the influence of the atmosphere, which is a matter of some importance. But many roots are dried in slices; and *bulbs* are first stripped of their outer layers, and then cut into transverse or longitudinal slices before drying.

*Leaves* are most vigorous, and contain their active principles in greater force when the process of flowering is somewhat advanced, but before it is fully accomplished. As a rule, they should be collected between the expanding of the flower and the ripening of the fruit. The leaves of *Aconitum Napellus* cause tingling and numbness in the lips, cheeks, and tongue, from their first appearance till the seeds begin to form; afterwards this property is lost, although the leaves still remain vigorous. Leaves may be either stripped from or dried with their stalks. When dried rapidly at 130° to 140° in a dark drying-room, until they crumble in the hand, they preserve their green colour and medicinal properties. Afterwards they are to be kept in closely-covered opaque jars, and powdered in quantities as required. The juices of leaves are less liable to deterioration by being inspissated in their own cells than they are by being formed into extracts, however carefully the process may be conducted. The drying of leaves is of no small importance, as upon the careful performance of this operation depends greatly their medicinal activity. It is important to preserve the colour both of leaves and flowers, for when the colouring matters are lost, other valuable principles go with them. The leaves of Digitalis, Belladonna, Stramonium, and other plants, contain less of their peculiar active principles when badly than when carefully dried.

*Flowers* are to be collected when they are partly or full blown. Some are collected soon after expansion has begun, and the *Rosa Gallica* is gathered before the bud is evolved, when the colouring and astringent principles are more abundant. Flowers are gathered at different times of day. If they are intended for immediate use, they may be collected either in the morning or in the evening; but if they are to be dried, they should not be taken when they are wet with dew or rain. When flowers are used for the sake of their odour, which arises from the presence of a volatile oil, they should not be gathered after they have been long exposed to the sun. The heat of the sun exhausts the odoriferous principle more rapidly than the plant can supply it, and in the heat of the day the odour of the plant is less powerful. They are suspended in bundles for drying, and are sometimes covered with paper to preserve them from the effect of light. Flowers should be dried promptly, but very carefully, and afterwards be preserved in well-closed opaque vessels.

*Fruits* are collected when nearly or quite ripe. If they are to be used immediately, they may be left until they are fully matured, but not until they have lost their plumpness, especially if the juices are prone to rapid change. If they are to be preserved in their fresh state, they must be taken a little earlier.

*Seeds* are taken when quite ripe, at the dehiscence of capsular fruits, and at the maturity of the pericarp in pulpy fruits. Seeds enclosed in *shells* should be preserved in them until required for use. Seeds require but little drying.

*Woods* are denser—and are said to yield more medicinal principles—in winter than at any other season. The wood of trees becomes denser if the bark be removed whilst they are standing, since the juices, then no longer finding their means of descent, become consolidated in the wood. A decorticated tree affords wood doubly rich in medicinal principles, not only because of its extra density, but also because it is found that trees deprived of their barks whilst standing become more quickly the prey of insects; and as these do not remove the active parts, weight for weight, such wood is more valuable than that procured in the ordinary way.

*Barks* are to be gathered when they can be most readily separated from the tree, either before or after the full development of vegetation, and not when the reproductive process is in activity. Spring is generally the most suitable time; and, as an example, oak bark contains more tannic acid at that period than at any other season.

*Desiccation and Preservation of Medicinal Plants generally.*—Medicinal substances derived from the vegetable kingdom are prone to deterioration by keeping. They should be frequently examined, and all simple indigenous herbaceous plants should be renewed annually. If the plants could be obtained in the recent state at all seasons, there would be no necessity for preserving them; but as this is not so, a store is to be laid up for use until a fresh supply can be obtained at the hands of nature. The first process in the art of preserving plants is to deprive them of their water of vegetation; and this is to be done with the utmost care, so that as little as possible of their fugitive principles may be lost. Desiccation is conducted in an appropriate room, usually a loft at the top of the house, constructed in such a manner that a free current of air may pass through it, whilst neither the sun's rays, nor rain, nor even much daylight, can find access. Drying should be done as promptly as the means employed will allow; when it is conducted too slowly prejudicial changes are apt to take place in the juices. The water is to be abstracted, not driven, from the plants; and for this purpose three qualities are necessary to the atmosphere that is to absorb the moisture—*a certain temperature, dryness, and movement.* Warm air will take up more moisture than an equal volume at a lower temperature; and if the air be kept in constant transit through the room—in at one end and out at the other—the drying may soon be accomplished. The current of air should be directed in such a manner that it may approach from the warm or sunny side of the building, where it will derive additional warmth from the venetians heated outside by the sun. When artificial heat is used, great care is to be observed that the temperature be not carried too high, nor raised too suddenly, otherwise the plants may be rendered useless by being parboiled in their water of vegetation. The substances to be dried are spread in thin layers, or hung in garlands, and frequently turned. When the drying is finished, they are left inflexible and brittle; but after a time they recover a certain amount of water from the atmosphere, and become more flexible. When the quantity to be dried is not great, boxes of suitable construction are used instead of a large apartment. In some cases, the less delicate plants are simply spread out in the open air in a shady place, protected only from the sun. When the medicinal property depends upon the presence of a volatile oil, desiccation should be conducted at as low a temperature as is consistent with the evaporation of the water.

3. *Examples quoted as evidences of the influence of such change of circumstances.*—The following have been mentioned by various writers:—Cinchonas that are grown on cold and exposed mountain sides are richer in alkaloids than others that are grown in close and unventilated valleys. Colchicum, which at all seasons in this country contains poisonous principles, has been eaten with impunity in other countries in autumn, according to Krapf, Kraterhvill, and Haller; and Orfila states that he has frequently, in the month of June, given two or three corms to dogs without producing any peculiar results, and hence he supposed that the deleterious properties are modified by climate and season. Buchner held that the plant is most energetic in autumn, when the flowering stem is rising. Professor Christison

believes it to be very energetic in spring, when it is watery, more membraneous, shrivels much in drying, and is very bitter. *Opium, Senna, Mentha, Digitalis, Agaricus piperatus, Amanita muscaria, Myrospermum*, and many others, have been quoted as examples of the influence of climate either in modifying the sensible characters or affecting the nature of certain active poisonous principles in plants. The Indian variety of hemp, when cultivated in this country, grows well, attaining a height of ten feet or more ; but it no longer possesses its narcotic properties, nor the resinous covering of its leaves. Haller states that Valerian, gathered in low situations from humid soil, is much less efficacious than that grown on the heights ; and in almost all cases where the same plant grows both in high and low situations, those of the higher locality will be found to be more prominent in their characteristic features. The *Solanaceæ* and the *Cruciferæ* thrive best in the vicinity of animal life, and are far less vigorous when grown in an arid soil. Some of the *Umbelliferæ* which are aromatic when grown in a dry soil, acquire poisonous qualities in a humid locality. Dr. Christison mentions that *Cicuta virosa* and *Œnanthe crocata*, both umbelliferous plants, which are generally poisonous in England, are harmless when gathered in native localities near Edinburgh. Almost all powerfully odoriferous plants lose their odour in a sandy soil. Assafœtida is modified both in its botanical characters and medicinal properties by change of soil. Russian rhubarb is said to contain a much larger proportion of inorganic matter than East Indian or English rhubarb. Some plants thrive best in a dry and porous, some in a gypseous, some in a nitrogenous soil. The oil obtained from plants grown at Mitcham varies both in quantity and quality with the season and soil. Two adjoining acres seldom yield alike. This fact is perhaps more remarkable in the case of *Peppermint* than of any other plant grown there. Of two crops of this plant growing close to each other, that which is most luxuriant in appearance may yield the smallest quantity of oil ; and between the oil obtained from plants grown at Mitcham and those grown at Carshalton, although they are adjoining parishes, there is a great difference both in quality and quantity—a fact due to soil alone, since the care bestowed on the cultivation is alike in both places.

Some medicinal plants are improved by cultivation, but hitherto wild specimens have been generally preferred. The flower of the Chamomile, like that of many other plants, is doubled by cultivation, and its medicinal value thereby greatly deteriorated. Wormwood loses much of its bitterness by cultivation. It is generally stated that by cultivation, which renders its growth more luxuriant, the medicinal virtues of Aconite are impaired. Geigar stated that acrid varieties of Monkshood lose their acridity by cultivation; but Dr. Christison affirms that this is not the case with the variety of *Aconitum Napellus* cultivated in the gardens and shrubberies of Scotland.

Plants vary considerably, both in physical qualities and in chemical composition, according to their ages. Young plants contain much water with mucilaginous principles, and at this stage of their existence can be used only to a very limited extent in medicine. At a later period their juices are more elaborated, and their secretions more complex. The different parts of plants vary also according to the age and condition of the plant. Barks are useless when too young, from not having had the necessary medicinal principles stored in them; and when too old their extractive matters become impaired, and their saline ingredients are exhausted by the rain percolating through their numerous fissures. Roots lose their succulent and flexible state, and become woody with age. In cases where the root bark is used, it is desirable that the roots should have attained a certain age; but where the substance of the root is used, it should be gathered while still flexible and containing duly elaborate juices. The narcotic principle of the poppy is not met with until the petals have fallen. The fruit of pimento changes the character of its flavour when allowed to attain maturity. Negroes feed upon the young shoots of a species of *Apocynum* without suffering any inconvenience, although, when fully developed, the plant contains poisonous and drastic principles. The clove is the unexpanded flower of *Caryophyllus aromaticus;* if it be allowed to expand, its peculiar taste and odour pass away, and they are not developed in the fruit. *Colchicum autumnale*, *Conium maculatum*, *Hyoscyamus niger*, and others, afford examples of the effect of age in modifying the medicinal properties of plants.

**The active principles of Medicines derived from the Vegetable Kingdom.**—We see, then, that there are several causes by which the medicinal properties of plants may be modified; and as these changes are effected chiefly through their *active principles*, it will be well for us to take a general view of the organic constituents concerned in the actions of medicines. When we regard the numerous substances of medicinal value that are formed during the growth of vegetables, remarking that, whilst they are frequently almost identical in constitution, yet they differ widely in their action when introduced into the human system, we see how much the physician is dependent upon the skill and accuracy of the pharmaceutical chemist. It is to organic chemistry that we owe the many elegant and powerful remedies of late years introduced into practice.

The organic proximate principles of which plants are composed, when resolved into their ultimate elements, are found to consist of varying combinations of Carbon, Hydrogen, Nitrogen, Oxygen, Phosphorus, and Sulphur; and according to the number of these elements, the number of atoms of each contained in the proximate principle, and the method of their arrangement, will be the nature and potency of the medicine thus derived. Some of the proximate principles of plants are exceedingly powerful, so as, in certain cases, to be poisonous in very small quantity; whilst others are nutrient, and supply the necessities of the animal economy. Of the former class, we have the alkaloids, neutral organic principles, organic acids, volatile or essential oils, resins, &c.; of the latter class, we have fixed oils and fats, starch, sugar, gum, and cellulose, besides the proteic or albuminoid compounds. We have space only for a word or two on each of these groups.

*Alkaloids* are, as the name implies, substances *like alkalies* (*alkali* and *εἶδος*, likeness) although they exhibit the properties of alkalies only to a limited extent. They are sometimes called *organic* or *vegetable* alkalies, the former because of their requiring a vital action to constitute them, and the latter with reference to their vegetable origin. The alkaloids are generally the most potent of the organic principles. They are for the most part solid and crystalline, but some are volatile. They are but sparingly soluble in water, more so in alcohol, and readily soluble in most of the dilute acids, and in ether and chloroform. The greater number are capable of restoring the blue colour to reddened litmus, and of forming with acids definite salts which are crystalline. Most of the alkaloids are quaternary compounds, consisting of C, H, N, O, in different proportions, but some few are ternary, and contain only C, H, N. Nitrogen is invariably one of their constituents. Various plants of the same natural family may yield a common alkaloid; but, on the other hand, many plants of a common family may each contain a distinct alkaloid, whilst in some instances, as in opium, several alkaloids are met with in a single plant. The alkaloids are not met with in a free state in plants, but usually in combination with peculiar vegetable acids. All poisonous plants are believed to contain either an alkaloid or a neutral characteristic principle. It may be useful to remember that *most* of the alkaloids can be precipitated from solution, whether they be uncombined or in the form of salts, by *tannic acid*, and that, therefore, substances containing this astringent principle may be used generally as antidotes. A little confusion sometimes arises between the nomenclature of the alkaloids and of the neutral principles. The names of both are usually derived either from some peculiar property of the principle itself, or from the name of the plant from which the principle is first obtained. By some writers the last syllable is written indiscriminately *in* or *ia;* whilst others adopt the general rule of terminating the vegetable or organic alkaloids with *ia* and the neutral vegetable principles with *in.* Thus we have the alkaloids *Aconitia, Delphinia, Quinia, Morphia, Strychnia,* &c., and the neutral organic principles, *Meconin, Guaiacin, Cusparin, Colocynthin. Elaterin,* &c.

*Neutral Organic Principles.*—These principles are usually ternary compounds, consisting of C, H, and O. Several of them are medicinal agents, whilst others appear to be almost inert. They are more or less bitter in taste, and when boiled with dilute sulphuric acid, they yield glucose or grape sugar, and are hence termed *Glucosides.*

*Organic Acids.*—Vegetable organic acids exist as salts in the juices of plants in combination with potash, soda, lime, or an alkaloid; but they are occasionally met with in the free state. They are generally solid and colourless, and mostly crystalline; they are soluble in water and alcohol, and in combination with bases form definite crystalline salts. Some volatilise readily when moderately heated in air, and all are decomposed when heated in closed vessels. Some of the acids, as tannic, are widely diffused through the vegetable kingdom, whilst others, as meconic, are restricted to a single family. Some of the vegetable acids are *educts,* others are both *educts* and *products;* or, in other words, some exist naturally as proximate principles of the plant, and can be separated by simple processes, whilst others, although in the same manner existing naturally in plants, may also be produced artificially from other organic materials. All the acids contain oxygen except *hydrocyanic,* which is the only one containing nitrogen.

*Volatile or Essential Oils.*—These oils are largely used in medicine for a variety of purposes besides that of imparting an agreeable taste and odour to offensive drugs. They are found most abundantly in the leaves and flowers of plants, from which they are obtained by distillation with water, or, in some instances, by expression from the cellular structure. The delicate and fugitive character of some of these oils demands most careful attention to the process of distillation. Volatile oils, when quite pure, are believed to be invariably colourless, though some have never yet been obtained in that state; and all, when exposed to air and light readily assume a certain colour. Their odour is similar to that of the plants yielding them, but they are seldom agreeable in the concentrated form. The readiest way to ascertain the true odour is to rub a drop on the hand, and then breathe upon it, or allow a little to be diffused through the air of an apartment. The essential oils, owing to their value, are greatly subjected to adulteration. By careful fractional distillation they may be separated into two parts, called *Elæoptene* and *Stearoptene* (ἔλαιον, *oil*, στέαρ, *fat*, and πτηνός, *volatile*) which have different specific gravities. The former of these is frequently a *hydrocarbon*, and the latter an *oxyhydrocarbon*, which in some instances is concrete, and frequently has the composition of ordinary camphor. The volatile oils may be chemically defined as—1. *Hydrocarbons* or *Camphenes*, constituted of C and H. Of this group oil of turpentine may be regarded as the type, with which, although their sensible properties vary considerably, the oils of lemon, bergamot, orange, juniper, and others, are isomeric. 2. *Oxyhydrocarbons*, containing, in addition to C and H, oxygen, which may exist either in both the Elœoptene and Stearoptene, or in the latter only. These oxygenated essential oils are the most soluble of the volatile oils in alcohol and water, and are extensively used in the form of medicated waters. This class includes also camphor and its modifications. 3. *Sulphuretted* and *Nitrogenated Oils.*—Many of the plants containing these oils are used for culinary purposes, as horse-radish and garlic. Except assafœtida, sagapenum, and garlic, all the oils of this class are derived from the *Cruciferæ.* There are a few volatile oils which contain nitrogen in the form of prussic acid; they are chiefly derived from the sub-order *Amygdalæ* of the *Rosaceæ.*

*Resins* are widely diffused through the vegetable kingdom, and are obtained either by spontaneous exudation, or by incisions made into the bark or wood of trees and shrubs. On exposure to the atmosphere the essential oil with which they are united either evaporates or solidifies by oxidation, and the resin assumes its hardened form. They are usually constituted of different resinous principles, which are capable of separation. The resins are dry, brittle, of varying taste, odour, and colour, all of which characters are probably due to the presence of ingredients not truly resinous; they are readily fusible, and very combustible, and become electric by friction. They are insoluble in water, more soluble in hot than in cold alcohol, and they are deposited from their solution on the addition of water, the water assuming a milky appearance. Most of them are soluble in ether, and in the fixed and volatile oils. Being insoluble in water, the resins cannot be prescribed with that alone, but may be made into *emulsions* by the addition of a little oil and gum, or yolk of egg. Resin of scammony may be given in milk or almond emulsion. In their medicinal effects the resins usually, but not invariably, resemble the *essential oils* to which they correspond. When they retain a considerable quantity of essential oil, they preserve a semi-liquid form, and are called *oleo-resins* or *terebinthinates;* but when hard and brittle, from the loss of the oil, they are *resins proper.* When *benzoic* or *cinnamic* acid enters into their constitution they are called *balsams*, and the admixture of gum separates them into the class of *gum-resins.*

*Extractive.*—Formerly, when plants possessed medicinal properties which could not be attributed to any recognised proximate principle, their actions were said to be due to the *extractive principle*—a term applied to a substance widely disseminated through the vegetable kingdom. The substance thus named, but even now ill-defined, gradually diminished in importance, as more complete analysis showed the presence of definite proximate principles, to which the actions of the plant as a medicine became referable. Formerly the extractive principle was presumed to be the common basis of all extracts, but subsequent investigations proved that it was not a simple principle, but a heterogeneous mixture of matters peculiar to individual plants. It is intimately associated with, but does not constitute, the active principle of the plant. It is recognised by its amorphous condition and brownish colour, by its distinct but variable taste, its solubility in water and in weak alcohol, its insolubility in absolute alcohol and in ether, and by the rapid change which it undergoes when exposed to the air—all of which characters, however, are more or less modified according to the source of the extractive. Seeing that this substance forms a part of very many medicinal plants, it must enter also into many pharmaceutical preparations, from which, however, may be excluded the following,—namely, solutions made with strong alcohol, ether, and oils, because it is insoluble in these menstrua ; and preparations made by distillation, because it is not volatile.

*Fixed Oils and Fats.*—These ternary non-nitrogenised organic principles, derived from the vegetable and animal kingdoms, are largely used, both as articles of diet and as medicines. When taken internally, they operate as nutrients, alteratives, demulcents, or cathartics; whilst externally, they are applied as emollients, and are largely used also as vehicles for more powerful medicines. They are subject to adulterations—the fine or superior varieties with the inferior qualities.

*Saccharine Principles.*—These substances, of ternary composition, exist both in vegetables and animals. They are characterised by a sweet taste, solubility in water, and, under certain circumstances, by their decomposition into alcohol and carbonic acid. The chief varieties of sugar are:—cane sugar (sucrose), grape sugar (glucose), fruit sugar (fructose), and sugar of milk (lactose). In a variety of forms, sugar is administered both medicinally, and as an article of diet.

*Starch.*—This ternary compound exists largely in plants, especially in the seeds and in the underground tubers and bulbous roots. There are many varieties, of which the chief are wheat-starch, potato-starch, rice-starch, arrowroot, sago, and tapioca. Starch is convertible into dextrine and grape-sugar. It is a valuable test for the presence of iodine, with which it forms a characteristic blue compound.

*Gum.*—There are several varieties of this ternary principle derivable from the vegetable kingdom, either by spontaneous exudation or by incisions into the barks of trees. The varieties are not readily distinguished; they have been classed into soluble gums, and those which swell up in cold water; of the former of which *Arabine* is the type, and of the latter *Tragacanthine* or *Bassorine.*

*Pectose, Pectin, Pectic Acid, Vegetable Jelly.—Pectose* exists in the succulent roots and acidulous fruits of many plants, and is converted by the organic acids, and by heat and light, into a soluble gelatinous substance called *pectin, parapectin, pectic acid,* &c. Pectin is formed during the ripening of the fruits, and gives the gelatinous character to the juices of currants, raspberries, &c., and also to the juices of some medicinal roots, such as gentian, dandelion, &c.

*Cellulose, Lignin, Woody Fibre.—Cellulose* or *cellular matter,* is an organised substance, without colour, taste, or smell, translucent when freed from foreign matter, and medicinally inert, occupying the cell walls of plants, and forming the pure base of woody fibre. It is nearly insoluble, and by the aid of sulphuric acid is convertible into dextrine. It is as much as possible excluded from nearly all pharmaceutical preparations used internally, but lignin is used externally in the form of cotton and lint, and enters into the compounds *pyroxylin* (gun-cotton) and *collodion.*

*Proteic or Albuminoid Substances.*—Besides the ternary proximate principles already enumerated, there are in all plants and animals certain neutral nitrogenous compounds, consisting of C, H, O, and N, for the most part in combination with sulphur and phosphorus. Mulder was the first to point out the general resemblance between these bodies, as existing in the vegetable kingdom, where they are represented by *gluten, albumen, casein,* or *legumin,* and in the animal kingdom, where they are met with as *fibrin, albumen, casein,* and *gelatin,* their constitution being almost identical in both kingdoms. With the exception of *gelatin,* these substances are said to be derivatives from a common principle, *protein,* which, according to Mulder, consists of $C_{18}H_{25}N_4O_5$, but according to Liebig and others, of $C_{24}H_{36}N_6O_7$; and it has been supposed that this principle, in combination with various proportions of sulphur and phosphorus, yields the above-mentioned and hence so-called *proteic compounds.* These principles, according to the modern chemical theory, form what are called the *flesh-forming* articles of diet, as distinguished from the non-nitrogenous ternary compounds, starch, sugar, and gum, which are said to be merely *heat-producing* substances. Although their composition is well understood, yet no definite chemical formulæ have been constructed to represent their constitution; but it is known that they readily undergo decomposition when exposed to moisture and a certain temperature, being converted into water, ammonia, carbonic acid, and other inorganic compounds. When these principles are in a putrefying condition they act as ferments to many organic substances, whereby a large number of the permanent pharmaceutical preparations would be destroyed were not these protein compounds removed by coagulation or precipitation.

## PHARMACEUTICAL OPERATIONS.

As a general rule, medicines are not obtained from nature in a condition fitted for immediate use: almost all medicinal substances, except mineral waters as a class, require to undergo certain processes to prepare them for administration. The operations performed upon them may be either mechanical or chemical.

The following—in alphabetical order—are the principal pharmaceutical processes, but including only such as are not commonly treated of in courses of lectures on chemistry:—

*Clarification.*—The removal of substances which impair the transparency of liquids. Heat is commonly employed for this purpose, as in the clarification of honey: the honey is melted in a water-bath, whereby the impurities are set at liberty, and may be either removed by subsidence, or by skimming, according to their density, or by filtration. But clarification is more commonly effected by means of albumen with the subsequent application of heat. White of egg is used for this purpose: it is first mixed with a little water and then added to the *cold* liquid, care being taken to diffuse it equally through the liquid before the application of heat. The temperature of the mixture is then gradually raised until the albumen coagulates, in doing which it seizes the impurities suspended in the liquid, and either floats or subsides with them according to their combined density, as compared with that of the fluid.

*Comminution.*—The process by which vegetable substances are broken into coarse pieces, as in the preparation of infusions and decoctions. This operation is effected by means of the cutting, *slicing*, *rolling*, *or cradle-knife*, when the substance is easily cut; but if it be dense and hard, as wood, roots, barks, &c., as a preparatory operation to powdering the *chopping-trough* is more suitable.

*Contusion.*—The process for powdering hard and tough substances. It is effected by means of the pestle and mortar, handworked if the quantity to be operated upon be small, but if large, the pestle is worked by machinery.

*Crushing* is an operation performed upon recent herbs to obtain their juices for various purposes. This process is sometimes effected by means of a pestle and mortar; but when the substance is in large quantity, it can only be accomplished by the aid of a *drug* or *pugging mill.*

*Crystallization.*—Many medicinal substances are directed to be kept in the crystalline form. It is the state in which they are least subject to adulteration; and the crystal is one of the chief characters by which we recognise them. Crystals are beautifully regular mathematical forms assumed by certain substances in their passage from a gaseous or liquid to a solid state. They are sometimes obtained from volatile substances by sublimation or by fusion; but far more commonly either by the gradual evaporation of the fluid in which the substances are dissolved, or by some chemical interference forming a new substance which the solvent is no longer capable of retaining. The hot and saturated solution from which crystals are generally obtained is first strained, and then "set aside to cool and crystallize." The finer crystals are obtained by the very slow, gradual, and uniform evaporation of a thoroughly strained solvent; and they are still finer if the concentration previous to the setting aside has not been carried too far. If the previous concentration is continued until a pellicle forms on the surface of the solution, the subsequent crystallization is effected more hastily, and the crystals are seldom distinct. The liquid that remains after the formation of the crystals is called the *Mother Liquor*, which still contains some of the substance in a concentrated form, in combination with any impurities that may have escaped the filter. According to the value of the substance, the mother liquor is either rejected or preserved for use in future operations. Some substances which crystallize with difficulty are obtained by *granulation.* This is done by constantly stirring the solution during its evaporation. Most crystals contain a definite quantity of solidified water called *water of crystallization*, or when it replaces a base, *water chemically combined.* Salts are called *deliquescent* when they absorb water from the atmosphere; *efflorescent* when they part with their water spontaneously; and *permanent* when they neither absorb nor give off water. Compounds containing water in definite proportions by weight are called *hydrates* (not to be confounded with *hydrides*, in which hydrogen is a constituent). Compounds which do not contain water, or from which it has been driven off by artificial processes, are called *anhydrates.* For the *systems* and other particulars of crystals, I must refer the student to works on *Crystallography.*

*Decantation* is the separation of a supernatant liquid from a precipitate or sediment collected at the bottom of the vessel. In this operation two things are to be guarded against—spilling the liquid, and disturbing the deposit. The following means are employed to facilitate this simple-looking but often difficult operation :—1. The guiding rod; 2. Greasing the rim of the vessel from which the fluid is to be poured; 3. The syphon; 4. The pipette; 5. The syringe.

*Decoction.*—See *Decocta* amongst galenical preparations, and also the following article—*Digestion.*

*Digestion* is the process for dissolving a medicinal substance in a menstruum by the aid of sustained heat. The terms Maceration, Digestion, and Infusion are often used indiscriminately. They have the following relative signification :—*Maceration* is when a solution is made with the menstruum at the ordinary temperature of the atmosphere (*cold infusion*); *Infusion* (*except cold infusions*), is when a solution is made with the menstruum originally at the boiling-point, but allowed to cool gradually; *Digestion* is when a solution is made with the menstruum a little below the boiling-point, but sustained at that temperature for a prescribed time—a process analogous to that of *simmering. Decoction* differs from the former process in this, that the menstruum is kept at the *boiling-point* for a given time, and is then allowed to cool gradually.

*Displacement* or *Percolation* is a process which has been gradually superseding that of *maceration.* The difference between the two processes is simply this, that in *maceration* the substance from which the desired ingredients are to be dissolved lies in the menstruum for a certain time; whereas in the process of *percolation or displacement,* it is suspended in the course of the menstruum which abstracts the desired ingredients as it filters through it. *Percolation* (*percolo,* to strain through) signifies nothing more than filtering in such a manner that all the menstruum shall come in contact with the whole of the contents of the filter; the object being not to remove impurities from the liquid, but to obtain a medicated filtrate. The term *displacement* relates to the fact that the fluid with which the substance is saturated can be displaced, under favourable circumstances, either by the addition of more of the same, or of another suitable fluid. A variety of instruments are used for this process, the rationale of which is this :—The substance to be operated upon is first reduced to a convenient state of division, and is then placed in a cylindrical vessel of such proportions that the height of the column shall be more considerable than the breadth, in order that the menstruum, as it passes through, may come into contact with as many layers as possible. Within the cylinder is a perforated diaphragm, which allows the passage of the menstruum after it has percolated the substance; but which, whilst it serves as a support to the latter, prevents its escape at the bottom of the cylinder. The lower part of the cylinder is contracted, so as to be under the control of a tap or a cork, and is adapted to a vessel suitable to receive the filtrate. The menstruum is then poured in certain quantities upon the substance in the cylinder, and so soon as it begins to drop into the receiver below, the process is either checked for a little while by a tap or cork at the lower end of the cylinder, or, if not, that which passes through first is sometimes returned to the cylinder to perform its work a second time. It is generally considered better to moisten the substance previous to packing it in the cylinder or percolator. Unless the process be well conducted, the result will not be satisfactory. The chief points to be regarded, and which I cannot here dwell upon, are—1. The state of division of the substance, which varies for different substances; 2. The degree of firmness with which it is packed; 3. The uniform permeation of the menstruum—care being taken to avoid its passage by *channels* or *interstices*. See *Tincturæ.*

*Distillation.*—The object of this process is to separate volatile from fixed ingredients in solution. It is analogous to the *sublimation* of dry substances. It differs from evaporation in its object—that of distillation being to preserve the volatile part, whilst the intention of evaporation is to dissipate it. The process is effected by the aid of heat and cold. The solution is heated to a temperature sufficient to convert the required part of it into vapour, which is carried to a separate part of the apparatus, to be again restored to its fluid form by the influence of cold. The temperature at which the process is carried out will depend upon the volatility and inflammability of the liquid to be operated upon. Sometimes a substance may be separated into several parts by a gradual increase of temperature, the part which is volatilisable at the lowest temperature passing over first (this is termed *Fractional Distillation*). Many of the officinal *waters*, *spirits*, &c., are prepared by distillation.

*Destructive Distillation* is a process conducted apart from atmospheric influence, whereby organic bodies, being subjected to a high temperature, lose their original form, and yield new products.

*Elutriation* is a process by which powders may be separated into quantities of different degrees of fineness. The powders to be operated upon are suspended in water—which must neither dissolve nor act chemically upon them—are carefully diffused through it, and the whole is allowed to stand for a little while. During this period of repose the heaviest particles sink to the bottom; the fluid is then decanted, leaving the coarser powder behind, which, when dried, forms one of the desired qualities. By repeating this process, each time allowing a longer period of repose, the powder may be reduced to the last degree of fineness. In this way also impurities, differing in intensity from the true powder, may be removed.

*Evaporation.*—Vaporisation is the conversion of fluid substances into vapour. It may be effected at various temperatures, according to circumstances. If the atmospheric pressure be removed, as when evaporation takes place under the bell of an air-pump, a very low temperature is required; and from this the process may be conducted at any temperature up to the boiling-point. Evaporation is used in the manufacture of many of the galenical preparations, but its most common application is to the preparation of extracts, under which it will be mentioned again.

*Filtration.*—This is a process for the separation of solid particles from the fluids in which they are held in suspension. For this purpose the liquids are passed through media of different degrees of porosity, according to the fineness of the particles which are to be kept back by their intervention. These media, called *Filters*, are made of different substances, and are constructed and supported in various ways to suit circumstances. In some cases organic materials are used, such as *woollen cloth*, *flannel*, *linen*, *calico*, and different qualities of *paper;* in others, inorganic materials are employed, such as *sand*, *powdered glass*, *powdered rock*, *crystal*, *prepared asbestos*, *charcoal*, &c. *Straining* differs from *filtering* only in being conducted with less care and greater rapidity; it is used when the entire separation of the solid particles is not essential. The object of filtration may be either to purify a liquid, discarding the solids; or it may be to obtain the solid contents, the liquid being unimportant; or it may be to separate them and preserve both. When the solid substance is a powder which, by its density, sinks in the liquid, it is called a *precipitate*, and the liquid separated from it by filtration is termed the *filtrate*.

*Granulation.*—Some of the metals, as zinc, tin, and others, are reduced to different states of division by this process. The operation varies according to the properties of the metal to be divided, and the condition required. Zinc may be melted and poured into water, by which it is coarsely divided; or it may be melted, and in this state be rubbed in an iron mortar until it is solidified, by which process it will be obtained in finer particles. Tin may be granulated by pouring it, in the molten state, into a strong wooden box, closing the lid firmly, and shaking it until it becomes solid. For the granulation of powders—see *Powders.*

*Infusion.*—See *Infusa* amongst galenical preparations; see also under *Digestion.*

*Levigation.*—The process of rubbing substances between two hard surfaces to reduce them to very fine powder. The substance to be operated upon is first formed into a paste by means of water, which constitutes the only difference between this process and *trituration,* for which no liquid is required. Substances that are powdered by levigation are sometimes formed into little conical masses, to facilitate the drying, of which we have an example in levigated chalk.

*Lixiviation* is the process used for the separation of the soluble from the insoluble parts of certain bodies, as in the preparation of soapmaker's ley. It is a form of the process of solution by percolation or displacement.

*Maceration* is the process for dissolving medicinal substances in liquids at the ordinary temperature of the atmosphere. The substance to be operated upon is previously prepared by comminution or coarse powdering, and the solvent, called the *menstruum,* is then poured over it. In this condition the ingredients are allowed to remain for a period varying from half-an-hour to several days, according to circumstances. Substances containing volatile principles that would be driven off by heat, and others which would yield undesirable ingredients to hot liquids, are prepared by maceration. The cold infusions, and most of the tinctures, are so prepared. Maceration is somewhat superseded by displacement or percolation. See *Digestion.*

*Porphyrisation* is a form of *trituration,* the substance being reduced to fine powder by rubbing it between a porphyry slab and muller. The substance to be operated upon is first coarsely powdered, and is next made into a moist, tenacious paste, or *magma,* by the addition of water, if that liquid does not act injuriously upon it. The muller is then worked in a regular curvilinear manner over thin layers of the mass. This method is not much used.

*Precipitation* is the process by which a solid substance may be separated from a fluid in which it was previously dissolved, the solid thus separated being either in the form of crystals, amorphous powder, or magma (a moist, tenacious mass). The substance may either fall to the bottom, be diffused through the liquid, or float on its surface; but more commonly, as the name implies, it is thrown down. The substance is called a *Precipitate*, and the agent which produces it is called the *Precipitant*. Precipitation may be caused by chemical or other changes which affect solubility. When two soluble chemical substances, having an affinity for each other, are brought together in solution, if between them they contain the elements of an insoluble compound, it will be formed and precipitated. This it is important to remember in the construction of magistral formulæ. Precipitation may also be caused by physically interfering with the solvent powers of the liquid; thus, there are certain alcoholic solutions which throw down their contents on the addition of water. Several of the tinctures are thus affected.

*Pulverisation.*—The powdering of drugs is chiefly executed by wholesale drug-grinders, whose *mills* are adapted to perform the operation in a suitable manner, and upon quantities equal to the enormous demand. In smaller quantities, drugs may be reduced to a state of division suited to different circumstances, by any of the following processes:—*Contusion*, *trituration*, *porphyrisation*, and *levigation*. All drugs before they are sent to the mill should be *garbled*—that is, all adulterations and inferior pieces should be rejected, and none but the best specimens should be allowed to undergo the operation of grinding. It is very difficult to pronounce the quality of some drugs when in a state of powder, and the best guarantee of their purity is a careful selection of pieces previous to grinding. Great care should also be taken in the process of drying the substances as a preliminary step to grinding; otherwise their medicinal activity may be greatly impaired by this part of the operation. In spite of all care, however, in the case of drugs possessing fugitive principles, there is always a certain deterioration. But when the substance contains a good deal of water, and is not readily injured in its properties by a drying heat, its strength is increased by powdering—that is, weight for weight; the relative increase of strength being equal to the loss of water. Powdered opium is an example of this. Powders are apt to be contaminated in their passage through the mill by admixture with the remnants of the substance previously ground, unless the rollers be carefully cleaned after each operation.

In some cases it is necessary, in order to reduce a substance to powder, to operate upon it in the presence of another substance, whose sole object is, by its greater hardness, to separate the particles of the drug. This agent is called a *medium* or *intermedium*, and the process is termed *mediate* or *intermediate pulverisation*. The degree of fineness to which a substance is to be powdered is a matter of importance. The more minutely a substance is divided, the more readily and powerfully it will act on the system; but substances containing delicate and fugitive principles are apt to be rendered inert if the pulverisation be carried too far.

Very fine powders may be obtained by the process of *dusting*. This may be effected by passing the finer particles of the powder through a lawn sieve, as in the *dusting-bottle*; or by means of a gentle current of air, so directed as to convey the lighter particles to a convenient receptacle during the operation of grinding or triturating. *Sifting* is merely a part of the process of pulverisation. When the substance has passed between the rollers, it is transferred, in portions, to the *drum-sieves* or sifting apparatus, which is generally worked by the same machinery as the rollers. The particles which are too coarse to pass through the sieves are returned to the mill.

*Solution.*—This process may be either of a simple or a complex character. It is *simple* when the substance dissolved can be recovered without having undergone any change; and it is *chemical* or *complex* when the substance is changed in its nature, so that on the evaporation of the solvent, or its removal by other means, it cannot be recovered in its original condition. Many of the officinal compounds are prepared by *chemical or complex solution*, as in the case of *Liquor Ammoniæ Acetatis*; but many others are prepared by *simple solution*, the object of which is merely to overcome the attraction of aggregation in the solid body, and to reduce it to a state of the finest division. In this form, medicines are more readily taken into the system than in any other; because, either within or out of the body, they must undergo solution before they can be taken into the circulation. The fluid used to dissolve the substance is called a *solvent* or *menstruum*. Of these, several are ordered in the Pharmacopœia—as water, at various temperatures, rectified and proof spirit, sherry, ether, &c.—for the preparation of infusions, decoctions, solutions, tinctures, and wines.

The term *Saturation* has both a strictly chemical and a pharmaceutical or physical signification. In the former sense it is synonymous with neutralisation, as when a certain quantity of acid is said to saturate or neutralise a given quantity of alkali. But when a liquor has dissolved as much of a solid substance as it is capable of taking up, the solvent is saturated in the physical sense. And it is to be remembered that when a solvent is saturated with one substance, so that it cannot take up any more of the same, it is still frequently available as a solvent of a different substance.

*Sublimation*—the vaporisation of solid substances, or, as it is sometimes called, *dry distillation*—is the process by which volatile principles, either previously existing or occasioned by the process, are obtained from dry substances. The process is conducted by the successive application of heat and cold to the substance. By the former the volatile principles are converted into vapour, and by the latter the vapour is *condensed* into the solid form. Calomel, corrosive sublimate, benzoic acid, camphor, &c., are prepared by this process.

*Trituration* is one of the processes applied to the pulverisation of drugs. When the substance is small in quantity, trituration is performed by means of the pestle and mortar, either worked by hand or by machinery. *Porphyrisation* and *levigation* are modifications of trituration. On a large scale, drugs are powdered by grinding. See *Pulverisation.*

*Washing.*—Impurities may be removed from precipitates, crystals, &c., by *washing*. This may be done by passing a stream of water, or other fluid, over them, projected from one of the *wash-bottles* so common in chemical and pharmaceutical laboratories.

**Weights and Measures.**—We cannot advance a step in our subject without a knowledge of the operations of weighing and measuring, and acquainting ourselves with the relative value of the different weights and measures. There are no processes in more frequent use than weighing and measuring. A steady hand, quick eye, and keen preception, combined with careful and dexterous manipulation, are essential to the performance of these operations; and such qualities on the part of the operator will be unavailing unless they be supported by clean and accurate instruments.

There is at present no universal standard by which the weights and measures of different countries can be tested. Attempts have been made to reduce them to a common denomination, fixed by an immutable standard; but hitherto these attempts have been unsuccessful. The *metrical system* of weights and measures has been adopted in many countries, and is now in its *permissive* stage in the United Kingdom. It is much more suitable than our ordinary system for analytical purposes, and is generally adopted by scientific men. The danger involved in introducing into the mixing and dispensing of medicines a system of weights and measures, as yet comparatively unknown and ill-understood in this country, has, however, deterred the authors of the British Pharmacopœia from giving it even as an alternative method, with the single exception of the formulæ for volumetric estimations. Its many advantages will doubtless bring it ultimately into general use. But with this we have not to deal; it is sufficient that we guard ourselves against errors that would lead to mischievous, if not dangerous, results in the preparation of simple and compound medicines.

THE BALANCE.—For weighing substances that differ much in volume and density, several balances are required. For ordinary purposes in preparing and dispensing medicines at least three are necessary—one for grains and parts of a grain; one for ounces and upwards; and one for pounds and upwards. For analytical purposes the balance must be exceedingly accurate and sensitive, so that one-hundredth of a grain, or less, added to one of the pans, may be decidedly appreciable. The Royal Society of London possesses an instrument, made by Ramsden, which will turn with the one-hundredth of a grain when loaded with ten pounds weight; and another instrument, by the same maker, is said to show a distinct movement on the addition of one sixteen-hundredth of a grain when loaded with five ounces. But for general pharmaceutical purposes a much less delicate instrument is needed; and for ordinary dispensing purposes, a balance turning readily with the tenth of a grain is sufficiently sensitive. For coarser weighing stronger and less delicate instruments are used.

*The lever of the balance should be inflexible, and the balance should never be overweighted.* A balance that has been constructed to weigh parts of a grain should never be loaded with ounces, nor an ounce balance with pounds, otherwise the instrument cannot afterwards be depended upon for the smaller quantities.

*The arms of the lever must be exactly the same in length and weight,* otherwise the result of the weighing will be incorrect. The smallest difference with respect to the length of the arms will lead to error; but, unless carefully examined and tested, an imperfection of this kind may be overlooked. The unloaded pans of an instrument having this imperfection may be apparently in perfect equipoise, and yet substances weighed in them will not afford the same results when the operation is conducted in a standard instrument. To guard against error, or to make use of a balance known to be of unequal arms, the following plan may be adopted:—Weigh the substance carefully, either by weights, or by means of any finely-divided substance, such as sand or small shot; then remove the substance from the pan, and restore the equilibrium of the balance by standard weights, which will accurately indicate the weight of the substance replaced by them. This is called *Double Weighing.* To ascertain whether a balance has this imperfection or not, it is only necessary to weigh some substance carefully, and then transpose the weights and the substance; if the results be the same, the balance is correct. Other points of importance in the selection of a balance are chiefly these: that the fulcrum be placed above the centre of gravity of the beam, that the fulcrum and the suspension points of the scales be exactly on the same level, and that friction be reduced to a *minimum.*

WEIGHTS may lead to errors from two causes: first, from not having been correctly made; and second, from loss of a portion of their substance through *wear and tear.* A set of standard weights should be carefully preserved for occasionally testing the weights in use. When in use, both the balance and weights must be kept from the effects of substances capable of injuring them, such as powerful chemical reagents. When not in use they are to be kept in a suitable case, free from dirt, and protected from rough usage.

MEASURES.—Up to a certain capacity, the measures used in pharmacy are commonly made of glass; beyond that they are made of metals. Like weights, measures are often incorrectly made; and when graduated they are not unfrequently erroneously marked. Glass measures have the advantages of transparency, cleanliness, and of remaining unaltered in capacity. Metallic measures are liable to indentation, which obviously alters their capacity. With an accurate balance and weights the capacity of measures may be readily tested. All that is necessary to be done is to place the suspected measure upon a perfectly smooth and level surface, pour into it a certain quantity of distilled water, at the temperature of 60° Fahr., until it reaches the mark to be tested, and ascertain the weight of the water. A gallon measure should be accurately filled by ten pounds of water; a pint measure by 1·25 pounds of water; a fluid ounce measure by one ounce; a fluid drachm measure by 54·68 grains; and the space occupied by a minim is equal to that occupied by water weighing 0·91 of a grain.

In dispensing medicines, the measure next in capacity to the quantity to be measured should be used. Because, however accurate the graduation may be, where the area of the measure is large, it is impossible to determine exactly the quantity in the measure. Thus a drachm should be separated by means of the one or two drachm measure, not by the ounce measure; an ounce by the ounce, not by the pint, measure.

*The Minim and the Drop.*—Sixty minims make one fluid-drachm, but sixty drops may be either more or less than a fluid-drachm, according to circumstances. The size of a drop—that is the smallest quantity of liquid that will fall by its own gravity—is susceptible of modification by several circumstances. The quantity of fluid contained in a drop varies, for example, according to the size and shape of the vessel from which it is poured. Drops of different liquids also vary in size to a considerable extent, so that a *poured* drop may range from one-third to three times the volume of a *measured* drop or *minim.* It is manifest, therefore, that in dispensing medicines the measure should always be employed. When a more than ordinary degree of accuracy is required, the *Minim-Meter* is used.

SPECIFIC GRAVITY.—The specific gravity of a medicine is frequently one of its most important characters, and we may often determine the purity and strength of a medicine by this test alone. In the preparation of fluid medicines we are guided by their specific gravities in fixing the degree of dilution or concentration. For example, the specific gravity of well-prepared dilute nitro-hydrochloric acid is 1·074, and that of Syrup of Tolu is 1·330; and if they have any other specific gravity they are faulty. It is obviously important, therefore, that we should be able readily and accurately to apply this test. The specific gravity of a medicinal substance is its density as compared with that of an equal volume of pure distilled water at a temperature of 60° Fahr., if the substance be solid or liquid; or, as compared with the density of an equal volume of atmospheric air of equal temperature, if the substance be gaseous. Different methods are pursued for testing the specific gravities of solid, liquid, and gaseous or vaporous substances; but for ordinary purposes the *Hydrometer* (*Areometer*, *Gravimeter*) is most useful, for it is of comparatively rare occurrence that we are called upon in practice to test the density of solids or gases. The *hydrometer* is an instrument used for ascertaining the specific gravities of liquids, and of this there are several varieties, differing in name and construction, according to the views of the inventors, or the purpose for which the instrument is destined. It receives the name of Alcohometer (for alcohol), Elæometer (for oils), Galactometer (for milk), Saccharometer (for syrups), Urinometer (for urine), &c. *Specific gravity beads* are hydrometers, and are used for similar purposes. The *specific gravity bottle* is also used; it is a bottle capable of holding a definite quantity of pure water at 60° Fahr. It is usually made to contain a thousand grains weight of water, and, when accurately filled with any other liquid, at the same temperature, its weight represents the specific gravity of that liquid. All the instruments now mentioned, equally with the ordinary weights and measures, are subject to imperfections, and none should be used that has not been specially tested. The volume and density of a liquid is altered by variations of temperature, and, therefore, the results given by testing the specific gravity would be erroneous, unless taken at the temperature at which the standard is fixed. Formerly, the temperature for taking specific gravities of medicines was 62° Fahr.; but in the British Pharmacopœia the operation is ordered to be conducted at 60° Fahr. When purchasing hydrometers it is important to know the temperature at which they were made, because if the specific gravity of a liquid be taken at a temperature differing from that at which the instrument was graduated, a certain correction must be made upon the result.

### *Weights and Measures of the British Pharmacopœia, with their Symbols.*

#### WEIGHTS.

| | | | | | |
|---|---|---|---|---|---|
| 1 Grain. | gr. | . . . | | = | 1 grain. |
| 1 Ounce. | oz. | . . . | | = | 437·5 grains. |
| 1 Pound. | lb. | = | 16 ounces | = | 7000 grains. |

#### MEASURES OF CAPACITY.

| | | | | |
|---|---|---|---|---|
| 1 Minim. | min. | = | 1 minim. | min. j. |
| 1 Fluid drachm. | fl. drm. | = | 60 minims. | min. lx. |
| 1 Fluid ounce. | fl. oz. | = | 8 fluid drachms. | fl. drs. viij. |
| 1 Pint. | O | = | 20 fluid ounces. | fl. oz. xx. |
| 1 Gallon. | C | = | 8 pints. | Oviij. |

Temperature in all cases is to be determined by Fahrenheit's thermometer; and the specific gravity of liquids is to be taken at the temperature of 60° (formerly 62°). All liquids are ordered by measure, unless it is stated otherwise.

#### MEASURES OF LENGTH.

1 Line, = $\frac{1}{12}$ inch.
1 Inch, = $\frac{1}{39·1393}$ seconds pendulum.
12 Inches, = 1 foot.
36 „ = 3 feet = 1 yard.
Length of pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea, . . . . . 39·1393 inches.

### *Relation of Measures to Weights of British Pharmacopœia.*

| | | | | |
|---|---|---|---|---|
| 1 Minim is the measure of | | | 0·91 | grains of water. |
| 1 Fluid drachm | „ | | 54·68 | „ |
| 1 Fluid ounce | „ | 1 ounce, or | 437·5 | „ |
| 1 Pint | „ | 1·25 lbs., or | 8,750·0 | „ |
| 1 Gallon | „ | 10 lbs., or | 70,000·0 | „ |

### *Weights and Measures of the Metrical System.*

1 Milligramme = the thousandth part of 1 gramme, or 0·001 grm.
1 Centigramme = the hundredth part ,, 0·01 ,,
1 Decigramme = the tenth part ,, 0·1 ,,
1 Gramme = weight of a cubic centimetre of water at 4° Centigrade, . 1·0 ,,
1 Decagramme = ten grammes, . . . 10·0 ,,
1 Hectogramme = one hundred grammes, . 100·0 ,,
1 Kilogramme = one thousand grammes, . 1000·0 ,,

### MEASURES OF CAPACITY.

1 Millilitre = 1 Cubic Centimetre, or the measure of 1 gramme of water.
1 Centilitre = 10 ,, ,, 10 ,,
1 Decilitre = 100 ,, ,, 100 ,,
1 Litre = 1000 ,, ,, 1000 ,, (1 kilo.)

### MEASURES OF LENGTH.

1 Millimetre = the thousandth part of one metre, or 0·001 metre.
1 Centimetre = the hundredth part ,, 0·01 ,,
1 Decimetre = the tenth part ,, 0·1 ,,
1 Metre = the ten-millionth part of a quarter of the meridian of the Earth.

### *Relation of Weights of the British Pharmacopœia to Metrical Weights.*

1 Grain = 0·0648 grammes.
1 Ounce = 28·3495 ,,
1 Pound = 453·5925 ,,

### *Relation of Measures of the British Pharmacopœia to Metrical Measures.*

1 Minim = 0·000059 litres.
1 Fluid drachm = 0·003549 ,,
1 Fluid ounce = 0·028396 ,,
1 Pint = 0·567936 ,,
1 Gallon = 4·543487 ,,

### *Relation of the Metrical Weights to the Weights of the British Pharmacopœia.*

1 Milligramme = 0·015432 grs.
1 Centigramme = 0·15432 ,,
1 Decigramme = 1·5432 ,,
1 Gramme = 15·432 ,,
1 Kilogramme = 2 lbs. 3 oz. 119·8 grs., or 15432·348 grs.

### *Relation of the Metrical Measures to the Measures of the British Pharmacopœia.*

1 Millimetre = 0·03937 inches.
1 Centimetre = 0·39371 „
1 Decimetre = 3·93708 „
1 Metre = 39·37079 „ or 1 yard 3·37 inches.
1 Cubic centimetre = 15·432 grain measures.
1 Litre = { 1 pint 15 oz. 2 drs. 11 min., or 15432·348 grain measures.

WEIGHTS.—The weights of the British Pharmacopœia differ from those of any previous pharmacopœia. They consist of a combination of two systems,—namely, the *avoirdupois* pound and ounce, with the *troy* grain. Formerly, troy, or apothecaries' weight, was exclusively used in pharmacy, and its relative proportions were as follows :—

1 Grain — gr. . . . . . = 1 grain.
1 Ounce — oz. . . . . . = 480 grains.
1 Pound — lb. = 12 ounces = 5760 „

But the Dublin College of Physicians, in the last edition of its Pharmacopœia, set aside the old troy weight, by adopting in its stead the imperial or avoirdupois weights for the ounce and higher denominations,—a departure from long established usage which appeared to the Medical Council judicious and worthy of imitation. Formerly there were two other denominations of weights between the ounce and the grain—namely, the *drachm*, equal to 60 grains, and the *scruple*, equal to 20 grains—but these have been abandoned by the Medical Council for the following reasons :—In troy or apothecaries' weight, the drachm and the scruple are both multiples of the grain, and integral parts of the higher denominations of weights, the ounce and the pound. But the troy grain will not adapt itself both to the old drachm and scruple and to the avoirdupois ounce and pound. If 60 grains were held to represent the drachm, then eight drachms would no longer represent the ounce, for 8 × 60 = 480 grains, which is the troy ounce; whereas the avoirdupois ounce, now used, equals only 437·5 grains. In like manner, if the drachm were 60 grains, then 128 × 60 (*i.e.*, the number of drachms in sixteen ounces multiplied by the number of grains in a drachm) would give 7680 grains to the pound, whereas the present pound is only equal to 7000 grains : and so also with the scruples. If they would have preserved the drachm and the scruple, the Medical Council would have had either to alter the relative value of these weights, as the Dublin College did—making the drachm to equal 54·68 grains, and the scruple to equal 18·22—or to substitute a new medical grain for the troy grain, hitherto the medical as well as the standard grain of the kingdom. But in deference to the general feeling of the medical profession, in the second edition of the British Pharmacopœia, the Medical Council so far relaxed the stringency of their proscription of the use of the lower denominations, drachm and scruple, as to leave it optional with the physician to use in prescribing, if he considered it more convenient, the symbols (ʒ) and (℈), instead of 60 grains and 20 grains respectively. They recommend, however, that drachm (or ʒ) shall in all cases mean 60 grains troy, and never the eighth part of the avoirdupois ounce; and that scruple (or ℈) shall in like manner mean 20 grains troy, and never the twenty-fourth part of the ounce.

MEASURES.—The measures of the British Pharmacopœia remain unchanged. It was considered impossible to improve the system which has become so familiar.

SYMBOLS.—The following changes have been made in the symbols of the weights and measures :—oz. instead of ℥ ; fl. oz. instead of f ℥ ; fl. dr. instead of f ʒ ; min. instead of ♏ ; and lb. (avoirdupois) instead of ℔ (troy), the bar across the letters being omitted. The numbers representing the quantity of solid ingredients are Arabic, those representing the quantity of fluids are Roman numerals.

## OFFICINAL FORMULÆ.

*Prescription* has a wider signification than *Formula*, for it includes general directions as to the treatment of the patient, not only by medicine, but also by diet, clothing, exercise, ventilation, &c.

*Formula* (diminutive of Forma, *a form*, *scheme*, *rule*, *recipe*) is restricted to the directions given in writing for the preparation and application of medicinal remedies. A *simple formula* consists of one medicinal preparation, either simple or compound. A *compound formula* consists of two or more. A formula constructed *extemporaneously* by the physician is called *magistral*, *i.e.*, written by a *master* of his profession. *Officinal* medicines are properly *shop*-medicines, because kept ready for use in shops (*officina*); but we confine the term to those prepared according to the formulæ of the British Pharmacopœia: therefore, a medicine that is "not officinal" is to be understood as not having the sanction of the Pharmacopœia. The individual formulæ for the preparation of officinal remedies will be given hereafter, under the name of each of the chief ingredients ; but there are certain groups of formulæ for what are indefinitely termed

*Galenical preparations,* which it will be serviceable at once to pass in review. They are the following :—

**Aquæ.**—There are twelve formulæ for *Distilled Waters* in the British Pharmacopœia. *Aqua Aurantii* is also *officinal,* but as it is chiefly imported from France, it is not included in the following list. Ten of the "waters" are rendered medicinal by distilling them with certain vegetable substances, whilst another is simply *Spring water* rendered tasteless and inodorous, and deprived as much as possible of impurities, by distillation. The volatile principles separated and retained by the distilled waters, are either abstracted from some part of the solid substance of the plant, as in *Aqua, Anethi, Carui, Cinnamomi, Fœniculi, Lauro-cerasi, Pimentæ, Rosæ et Sambuci;* or from the volatile oils previously obtained from the plants, as in *Aqua Menthæ Piperitæ et Aqua Menthæ Viridis. Aqua* (formerly *Mistura*) *Camphoræ* is an exception to the rule; it is prepared by simply keeping the camphor immersed in distilled water; and Aqua Chloroformi, which is chloroform dissolved in distilled water.

*Distilled Waters* are chiefly used as vehicles for other medicines; but some of them are given to children alone, in doses of *fl. dr.* i-ii, and to adults in doses of *fl. oz.* ss-j. *Aqua Lauro-cerasi* is a very uncertain preparation, as to its strength, and is never given to children, and to adults in doses not exceeding min. x to *fl. dr.* i. *Aqua Rosæ* is chiefly used as an elegant vehicle for lotions and collyria. The distilled waters formerly contained spirit to preserve them; but far from this, it spoiled them by undergoing the acetous fermentation (WARRINGTON).

### AQUA.

| | | Water. | Distil. |
|---|---|---|---|
| *Anethi.* | Dill, *lb.* 1. . . . . . . | C 2 | C 1 |
| *Camphoræ* (*Mistura*). | Camphor, *oz.* ½. . . . (distilled) | C 1 | |
| *Carui.* | Caraway, *lb.* 1. . . . . . | C 2 | C 1 |
| *Cinnamomi.* | Cinnamon, *oz.* 20. . . . . . | C 2 | C 1 |
| *Destillata.* | Water, free from taste and odour. . | C 10 | C 8 |
| *Fœniculi.* | Sweet fennel fruit, *lb.* 1. . . . | C 2 | C 1 |
| *Lauro-cerasi.* | Fresh leaves of common laurel, *lb.* 1. | O 2½ | O 1 |
| *Menthæ Piperitæ.* | Oil of peppermint, *fl. drs.* 1½. . . | C 1½ | C 1 |
| *Menthæ Viridis.* | Oil of spearmint, *fl. drs.* 1½. . . | C 1½ | C 1 |
| *Pimentæ.* | Pimento, *oz.* 14. . . . . . | C 2 | C 1 |
| *Rosæ.* | Fresh petals of Rosa centifolia, *lb.* 10. | C 2 | C 1 |
| *Sambuci.* | Fresh elder flowers, free from stalks, *lb.* 10. . . . . . . . | C 2 | C 1 |

**Cataplasmata.**—There are six formulæ for *Poultices* in the British Pharmacopœia. Poultices consist of—the *liquor*, or fluid part; the *corpus*, or substance of the poultice; and the *accessorium*, or active medicinal ingredient. Of the officinal cataplasms, the *liquor* is boiling water (with one exception, *C. Fermenti*); the *corpus* is linseed meal, bread, or flour; and the *accessorium* is charcoal, hemlock leaf, beer yeast, mustard, or chlorinated soda. Water at a higher temperature than 100° would interfere with the catalytic process in C. Fermenti. *Magistral* cataplasms may include many other ingredients, whether liquid or solid. When an active medicinal substance is added, it must be incorporated with the *liquor* and *corpus* of the poultice at such a temperature that, if fugitive, it be not driven off; and in such a manner as to approach near to the part to which the poultice is applied, for a remedial agent buried in the depths of a thick, tenacious poultice would be of little service. The *liquor* may consist of a decoction of a medicinal plant. Cataplasms, though easily made, demand both knowledge and care; for, as Dr. Paris said, "Science does not withhold her aid even on the humble occasion of making a poultice." The temperature and tenacity of the poultice are important points: it should have a medium consistency, neither too dry nor too soft, and should be able to supply a sufficiency of moisture, without scattering its *liquor* to the discomfort of the patient. Poultices are employed chiefly to supply warmth and moisture; they are sometimes applied cold, more frequently tepid, and sometimes as hot as the patient can bear them, and are used according to circumstances, as *emollients*, *stimulants*, *or counter-irritants* (sinapisms), *sedatives*, *antiseptics*, *refrigerants*, &c. When the part is to be softened and lubricated, fatty substances are added. *Spongio-piline* is sometimes used as an elegant substitute for a cataplasm when heat and moisture alone are required.

### CATAPLASMA.

| | |
|---|---|
| *Carbonis.* | Wood Charcoal, *oz.* ½; bread, *oz.* 2; linseed meal, *oz.* 1½; boiling water, *fl. oz.* 10. |
| *Conii.* | Hemlock leaf, *oz.* 1; linseed meal, *oz.* 3; boiling water, *fl. oz.* 10. |
| *Fermenti.* | Beer yeast, *fl. oz.* 6; flour, *oz.* 14; water at 100°, *fl. oz.* 6. |
| *Lini.* | Linseed meal, *oz.* 4; olive oil, *fl. oz.* ½; boiling water, *fl. oz.* 10. |

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|---|---|
| *ıpis.* | Mustard, *oz.* 2½; linseed meal, *oz.* 2½; boiling water, *fl. oz.* 10. |
| *æ Chloratæ.* | Solution of chlorinated soda, *fl. oz.* 2; linseed meal, *oz.* 4; boiling water, *fl. oz.* 8. |

**onfectiones.**—There are eight formulæ for *Confections* in the ish Pharmacopœia. The terms *Electuarium* and *Conserva* are ished. Confections serve two chief purposes; they are useful cipients for medicines that are given in large quantities, such as ders, which, being almost insoluble, cannot be given agreeably in form of mixture; and they serve also to give a proper consistency ill masses. The solid substances of the confection are formed a softish pasty mass by means of honey, syrup, mucilage, treacle, Those made with mucilage soon become hard, and syrup is apt ystallize, unless certain precautions be used. These medicines of ancient date, and formerly consisted of most chaotic masses, they are now comparatively seldom used. Several of the confec- s of older pharmacopœias are no longer officinal, and two have ged their names and conditions—namely, the old *Confectio gdalæ*, or *Conserva Amygdalarum*, which is now a dry prepara- under the name of *Pulvis Amygdalæ Compositus*; and the old *ectio Aromatica* (P.L.), which is now represented with some ges by *Pulvis Cretæ Aromaticus*.

### CONFECTIO.

| | |
|---|---|
| . | Compound powder of opium, *gr.* 192; syrup, *oz.* 1. |
| *ris.* | Black pepper, *oz.* 2; caraway, *oz.* 3; clarified honey, *oz.* 15. |
| *Caninæ.* | Hips, deprived of seeds, *lb.* 1; refined sugar, *lb.* 2. |
| *Gallicæ.* | Fresh red-rose petals, *lb.* 1; refined sugar, *lb.* 3. |
| *ımonii.* | Scammony, in fine powder, *oz.* 3; ginger, *oz.* 1½; oil of caraway, *fl. dr.* 1; oil of cloves, *fl. dr.* ½; syrup, *fl. oz.* 3; clarified honey, *oz.* 1½. |
| *æ.* | Senna, *oz.* 7; coriander, *oz.* 3; figs, *oz.* 12; tamarinds, *oz.* 9; cassia pulp, *oz.* 9; prunes, *oz.* 6; extract of liquorice, *oz.* ¾; refined sugar, *oz.* 30; distilled water, a sufficiency to make the result weigh *oz.* 75. |
| *ıuris.* | Sublimed sulphur, *oz.* 4; acid tartrate of potash, *oz.* 1; syrup of orange peel, *fl. oz.* 4. |
| *ınthinæ.* | Oil of turpentine, *fl. oz.* 1; liquorice root, *oz.* 1; clarified honey, *oz.* 2. |

**Decocta.**—There are fourteen formulæ for *Decoctions* in the British Pharmacopœia. They are all made by boiling vegetable substances in water, the object of the process being to obtain principles which cannot be separated at a lower temperature. Vegetables containing fugitive principles, or such as are injured by a high temperature, cannot be used as decoctions. The time prescribed for boiling the officinal decoctions is from five to twenty minutes, except *D. Granati Radicis*, which is boiled from two pints to one; and they are to be strained immediately after the boiling, except in the cases of *D. Cinchonæ Flavæ*, *D. Aloes Comp.*, *D. Sarsæ*, and *D. Sarsæ Comp.*, the first being strained when *cold*, the rest when *cool*. All the formulæ for the officinal decoctions are *simple*, except *D. Aloes Co.*, and *D. Sarsæ Co.* Decoctions are prone to change, and therefore should be made only when required, or if prepared in anticipation, should be frequently renewed.

| | Decoctum. | Dist. Water. | Minutes, to Boil. | Prodt. |
|---|---|---|---|---|
| *Aloes Compositum.* | Extract of socotrine aloes, *gr.* 120.<br>Myrrh, *gr.* 90; saffron, *gr.* 90.<br>Carbonate of potash, *gr.* 60.<br>Extract of liquorice, *oz.* 1.<br>Comp. tinct. of cardamoms, *fl. oz.* 8. | *Q.S.* | 5 | *fl. oz.* 30 |
| *Cetrariæ.* | Iceland moss, *oz.* 1. | O 1 | 10 | O 1 |
| *Cinchonæ Flavæ.* | Yellow cinchona bark, *oz.* 1¼. | O 1 | 10 | O 1 |
| *Granati Radicis.* | Pomegranate root, fresh or dry, *oz.* 2. | O 2 | boil to | O 1 |
| *Hæmatoxyli.* | Logwood chips, *oz.* 1; cinnamon, *gr.* 60. | O 1 | 10 | O 1 |
| *Hordei.* | Pearl barley, *oz.* 2. | O 1½ | 20 | |
| *Papaveris.* | Poppy capsules, without seeds, *oz.* 2. | O 1½ | 10 | O 1 |
| *Pareiræ.* | Pareira, *oz.* 1½. | O 1 | 15 | O 1 |
| *Quercus.* | Oak bark, *oz.* 1¼. | O 1 | 10 | O 1 |
| *Sarsæ.* | Jamaica sarsaparilla, cut transversely, *oz.* 2½. | O 1½ | 10 | O 1 |
| *Sarsæ Compositum.* | Jamaica sarsaparilla, cut transversely, *oz.* 2½.<br>Sassafras chips, *oz.* ¼.<br>Guaiac wood turnings, *oz.* ¼.<br>Fresh liquorice root, *oz.* ¼.<br>Mezereon, *gr.* 60. | O 1½ | 10 | O 1 |

| | DECOCTUM. | Dist. Water. | Minutes, to Boil. | Prodt. |
|---|---|---|---|---|
| *Scoparii.* | Dried broom tops, *oz.* 1. | O 1 | 10 | O 1 |
| *Taraxaci.* | Dried dandelion root, *oz.* 1. | O 1 | 10 | O 1 |
| *Ulmi.* | Elm bark, in small pieces, *oz.* 2½. | O 1 | 10 | O 1 |

**Emplastra.**—There are fourteen formulæ for *Plasters* in the British Pharmacopœia. Several of the old plasters are omitted, but there are no additions, except that *Ceratum Saponis Compositum* of the London Pharmacopœia is introduced under the name of *Emplastrum Cerati Saponis.* All true plasters have for their basis *litharge*, in combination with *Oleic*, *Margaric*, and *Stearic* acids. Eleven of the officinal plasters are so prepared. The rest are not strictly plasters, although so called; they owe their consistency either to wax, suet, resin, and lard, as in *Emp. Cantharidis;* to pitch, frankincense, resin, wax, &c., as in *Emp. Picis;* or to the chemical action of the ingredients upon one another, as in *Emp. Ammoniaci cum Hydrargyro.* Plasters are used externally, and adhere more or less firmly to the surface of the body, according to the amount of resin present; but as this is an irritating ingredient, its quantity should be modified according to the sensitiveness of the skin, and other circumstances. Changes may be made upon the officinal plasters; other ingredients may be added or quantities modified; but commonly one or other of the officinal forms is prescribed. They are kept in rolls, and are spread to the required size upon leather, cloth, calico, linen, silk, or other fabric (but chiefly leather), to suit the occasion, care being taken not to injure them by melting at a needlessly high temperature. Plasters are used to give mechanical support, and also as a mode of the external application of medicines, and are to be selected accordingly. *Emplast. Cantharidis* is vulgarly called "*a blister*," or "*a rising blister.*"

| | EMPLASTRUM. |
|---|---|
| *Ammoniaci cum Hydrargyro.* | Ammoniac, *oz.* 12; mercury, *oz.* 3; olive oil, *fl. dr.* 1; sulphur, *gr.* 8. |
| *Belladonnæ.* | Extract of belladonna, *oz.* 3; resin plaster, *oz.* 3; rectified spirit, *fl. oz.* 6. |
| *Calefaciens.* | Cantharides, *oz.* 4; expressed oil of nutmeg, *oz.* 4; yellow wax, *oz.* 4; resin, *oz.* 4; soap plaster, *lb.* 3¼; resin plaster, *lb.* 2; boiling water, *O* 1. |
| *Cantharidis.* | Cantharides, *oz.* 12; yellow wax, *oz.* 7½; prepared suet, *oz.* 7½; resin, *oz.* 3; prepared lard, *oz.* 6. |

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| *Cerati Saponis.* | Hard soap, *oz.* 10 ; yellow wax, *oz.* 12½ ; olive oil, *O* 1 ; oxide of lead, *oz.* 15 ; vinegar, *C* 1. |
| *Ferri.* | Peroxide of iron, *oz.* 1 ; Burgundy pitch, *oz.* 2 ; lead plaster, *oz.* 8. |
| *Galbani.* | Galbanum, *oz.* 1 ; ammoniac, *oz.* 1 ; yellow wax, *oz.* 1 ; lead plaster, *oz.* 8. |
| *Hydrargyri.* | Mercury, *oz.* 3 ; olive oil, *fl. dr.* 1 ; sublimed sulphur, *gr.* 8 ; lead plaster, *oz.* 6. |
| *Opii.* | Finely powdered opium, *oz.* 1 ; resin plaster, *oz.* 9. |
| *Picis.* | Burgundy pitch, *oz.* 26 ; common frankincense, *oz.* 13 ; resin, *oz.* 4½ ; yellow wax, *oz.* 4½ ; expressed oil of nutmeg, *oz.* 1 ; olive oil ; *fl. oz.* 2 ; water, *fl. oz.* 2. |
| *Plumbi.* | Oxide of lead, *lb.* 4 ; olive oil, *C* 1 ; water, *O* 3½. |
| *Plumbi Iodidi.* | Iodide of lead, *oz.* 1 ; soap plaster, and resin plaster, of each *oz.* 4. |
| *Resinæ.* | Resin, *oz.* 4 ; lead plaster, *lb.* 2 ; hard soap, *oz.* 2. |
| *Saponis.* | Hard soap, *oz.* 6 ; lead plaster, *lb.* 2¼ ; resin, *oz.* 1. |

**Enemata.**—There are six formulæ for *Enemata* in the British Pharmacopœia. A great variety of *Magistral* formulæ for enemata are constructed to suit special circumstances. We shall revert to this subject when treating of the channels by which medicines are introduced into the system.

### ENEMA.

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| *Aloes.* | Aloes, *gr.* 40 ; carbonate of potash, gr. 15 ; mucilage of starch, *fl. oz.* 10. |
| *Assafœtidæ* (*Fœtidum*). | Assafœtida, *gr.* 30 ; distilled water, *fl. oz.* 4. |
| *Magnesiæ Sulphatis* (*Catharticum*). | Sulphate of magnesia, *oz.* 1 ; olive oil, *fl. oz.* 1 ; mucilage of starch, *fl. oz.* 15. |
| *Opii.* | Tinct. of opium, *fl. dr.* ½ ; mucilage of starch, *fl. oz.* 2. |
| *Tabaci.* | Tobacco leaf, *gr.* 20 ; boiling water, *fl. oz.* 8. |
| *Terebinthinæ.* | Oil of turpentine, *fl. oz.* 1 ; mucilage of starch, *fl. oz.* 15. |

**Essentiæ.**—Essences, as distinguished from spirits, are strong solutions of volatile oils. Two are introduced into the British Pharmacopœia, and they each contain one part of the volatile oil to four of rectified spirit.

### ESSENTIA.

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|---|---|
| *Anisi.* | Oil of anise, *fl. oz.* 1 ; rectified spirit, *fl. oz.* 4. |
| *Menthæ Piperitæ.* | Oil of peppermint, *fl. oz.* 1 ; rectified spirit, *fl. oz.* 4. |

**Extracta.**—There are thirty-seven formulæ for *Extracts* in the British Pharmacopœia. Many of the old extracts are omitted, and several new ones added. Among the latter is a new order of "liquid" extracts. *Extractum Cinchonæ Flavæ Liquidum* is very nearly the same as the old *Infusum Cinchonæ Spissatum*, and the *Extractum Filicis Liquidum* was formerly called *Oleum Filicis-Maris*. Extracts, when carefully prepared, are an exceedingly useful class of remedies; but, unfortunately, they are often spoiled in the making, and are then worse than useless. We shall briefly examine the process of the preparation in three stages. 1. The substances from which they are prepared, and the preliminary steps taken with them. 2. The separation of the active principles. 3. The evaporation.

1. Extracts are derived from different parts of plants, *e.g.*, fresh leaves, flowering tops, young branches, flowers, roots, barks, corms, woods, resins, &c.; and these are subjected to some preliminary operations, such as bruising, crushing, coarsely and finely powdering, slicing, &c.

2. The active principles are separated by various means, such as—by simply squeezing out the juice—*fresh* or *green extracts;* by cold or boiling distilled water—*aqueous extracts;* by rectified, proof, or more diluted spirit—*alcoholic extracts;* by ether, *ethereal extracts;* by acetic acid—*acetic extract.* In the preparation of *fresh* or *green* extracts the juice of the plant is pressed out and at once evaporated. The solutions from which the *aqueous* extracts are made are prepared either by *decoction*, *infusion*, or *digestion in boiling water*, or by *maceration in cold water*, and are recovered either by means of the press or displacement. *Alcoholic* extracts are prepared by macerating the substances in the spirit for a fixed time, recovering the solution by pressure or percolation, and removing the spirit by distillation. In the preparation of *Ext. Ergotæ Liquidum*, the ergot is first percolated with ether to remove its oil, and afterwards it is prepared as an aqueous extract. *Extractum Filicis Liquidum* is percolated with ether (which is either removed by the water-bath or recovered by distillation) to procure at once the oily extract.

3. It is only now, when the active principles have been extracted from the vegetable substances and are held in solution, that the difficulty and danger begin. The next step is to bring them to the state of extracts without injuring them. The chief risks to which they are exposed in this part of the process, are excessive heat and atmospheric influences. Evaporation may be conducted—1. Spontaneously; 2. Over a naked fire; 3. In a water-bath or steam-bath; 4. In vacuo. The plan to be adopted will depend upon the nature of the ingre-

dients, the more common method being by the water-bath or steam-bath. When a very low temperature is desirable, the pressure of the atmosphere is removed, the evaporation being conducted *in vacuo.* The lower the temperature the better, provided it be sufficient to conduct the process with promptness, but a lingering process leads to injurious chemical changes. Two things are essential to the *preservation* of extracts—*coolness* and *dryness;* a high temperature promotes fermentation; a damp atmosphere causes mouldiness. The *green colour* of fresh extracts is sometimes urged as a proof of the excellence of the preparation, but it is no proof at all, seeing that the green colouring matter is carefully nursed, whilst the active part of the extract is undergoing the critical process of evaporation.

*Liquid* or *fluid* extracts have been gradually coming into use for several years, and are found to be very suitable preparations for many medicines. They are seven in number, but two of them under other names were previously officinal. The liquid extracts of *Bael*, *Ergot*, and *Pareira* are made in such a way that each fluid part represents an equal part of the drug employed, a fluid ounce of the preparation being equal to a solid ounce of the vegetable. Extracts contain the medicinal constituents of plants reduced to a minimum bulk, and, when carefully prepared, are very useful, for they generally create less objection on the part of the patient than any other form of medicine. They are given either alone, or in combination with other medicines, either in the form of a pill, or (the aqueous variety) dissolved in mixture. The initials in the following list signify:—*a.* Extracts prepared from the fresh juice (*fresh* or *green*); *b. aqueous extracts; bb. alcoholic extracts; c. liquid extracts; cc. liquid extracts* prepared more or less by ether; *aa. fresh* or *green extracts,* but the process is a little different.

### EXTRACTUM.

| | |
|---|---|
| *a. Aconiti.* | Fresh leaves and flowering tops of aconite, *lb.* 112. |
| *b. Aloes Barbadensis.* | Barbadoes aloes, *lb.* 1; boiling dist. water, *C* 1. |
| *b. Aloes Socotrinæ.* | Socotrine aloes, *lb.* 1; boiling dist. water, *C* 1. |
| *b. Anthemidis.* | Chamomile flowers, *lb.* 1; oil of chamomile, min. 15; distilled water, *C* 1. |
| *c. Belæ Liquidum.* | Bael, *lb.* 1; distilled water, *O* 12; rectified spirit, *fl. oz.* 2. |
| *a. Belladonnæ.* | Fresh leaves and young branches of belladonna. *lb.* 112. |
| *bb. Calumbæ.* | Calumba, *lb.* 1; distilled water, *O* 4. |
| *bb. Cannabis Indicæ.* | Indian hemp, *lb.* 1; rectified spirit, *O* 4. |

| | |
|---|---|
| *c. Cinchonæ Flavæ Liquidum.* | Yellow cinchona bark, *lb.* 1; distilled water, *Q.S.;* rectified spirit, *fl. oz.* 1. |
| *aa. Colchici.* | Fresh colchicum corms, deprived of their coats, *lb.* 7. |
| *aa. Colchici Aceticum.* | Fresh colchicum corms, deprived of their coats, *lb.* 7; acetic acid, *fl. oz.* 6. |
| *bb. Colocynthidis Compositum.* | Colocynth, freed from seed, *oz.* 6; extract of socotrine aloes, *oz.* 12; resin of scammony, *oz.* 4; hard soap, *oz.* 3; cardamoms, in fine powder, *oz.* 1; proof spirit, *C* 1. |
| *a. Conii.* | Fresh leaves and young branches of hemlock, *lb.* 112. |
| *cc. Ergotæ Liquidum.* | Ergot, *lb.* 1; ether, *O* 1 or *Q.S.;* distilled water, *O* 3½; rectified spirit, *fl. oz.* 8. |
| *cc. Filicis Liquidum.* | Fern root, *lb.* 2; ether, *O* 4 or *Q.S.* |
| *b. Gentianæ.* | Gentian, *lb.* 1; boiling distilled water, *C* 1. |
| *b. Glycyrrhizæ.* | Liquorice root, *lb.* 1; distilled water, *O* 4. |
| *Glycyrrhizæ Liquidum.* | Liquorice root, *lb.* 1; distilled water, *O* 4. |
| *b. Hæmatoxyli.* | Logwood chips, *lb.* 1; boiling dist. water, *C* 1. |
| *a. Hyoscyami.* | Fresh leaves and young branches of hyoscyamus, *lb.* 112. |
| *bb. Jalapæ.* | Jalap, *lb.* 1; rect. spirit, *O* 4; dist. water, *C* 1. |
| *b. Krameriæ.* | Rhatany, *lb.* 1; distilled water, *Q.S.* |
| *a. Lactucæ.* | The flowering herb of lettuce, *lb.* 112. |
| *bb. Lupuli.* | Hop, *lb.* 1; rect. spirit, *O* 1½; dist. water, *C* 1. |
| *cc. Mezerei Æthereum.* | Mezereon cut small, *lb.* 1; rectified spirit, *O* 8; ether, *O* 1. |
| *bb. Nucis Vomicæ.* | Nux vomica, *lb.* 1; rectified spirit, *Q.S.* |
| *b. Opii.* | Thinly sliced opium, *lb.* 1; distilled water, *O* 6. |
| *c. Opii Liquidum.* | Extract of opium, *oz.* 1; distilled water, *fl. oz.* 16; rectified spirit, *fl. oz.* 4. |
| *bb. Papaveris.* | Poppy capsules, dried, freed from seeds, and coarsely powdered, *lb.* 1; rectified spirit, *fl. oz.* 2; distilled water, *Q.S.* |
| *b. Pareiræ.* | Pareira root in coarse powder, *lb.* 1; boiling distilled water, *C* 1 or a sufficiency. |
| *c. Pareiræ Liquidum.* | Pareira, *lb.* 1; boiling distilled water, *C* 1 or *Q.S.;* rectified spirit, *fl. oz.* 3. |
| *bb. Physostigmatis.* | Calabar bean in coarse powder, *lb.* 1; rectified spirit, *O* 4. |
| *b. Quassiæ.* | Quassia wood, rasped, *lb.* 1; dist. water, Q.S. |

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|---|---|
| *bb. Rhei.* | Rhubarb, *lb.* 1; rect. sp., *fl. oz.* 10; dist. water, *O* 5. |
| *c. Sarsæ Liquidum.* | Jamaica sarsaparilla, cut transversely, *lb.* 1; dist. water, at 160°, *O* 14; rect. spirit, *fl. oz.* 1. |
| *bb. Stramonii.* | Stramonium seeds, *lb.* 1; ether, *O* 1 or *Q.S.*; proof spirit and distilled water, of each *Q.S.* |
| *aa. Taraxaci.* | Fresh dandelion root, *lb.* 4. |

**Glycerina.**—This is a class of preparations made officinal for the first time in the second edition of the British Pharmacopœia. They are five in number, and form elegant vehicles for the application and administration of the active principles dissolved in the glycerine. In their formation the excellent solvent and antiseptic properties of glycerine are utilised. Glycerinum amyli was introduced a few years ago by Mr. Schacht of Clifton, under the name of "plasma," as a fit substitute to replace the oily bases of ointments and other preparations. It is specially worthy of attention, as it has no tendency to become rancid, and is thus better suited than ordinary ointment to preserve any active principle liable to decomposition, while it is, at the same time, more agreeable and cleanly.

### GLYCERINUM.

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| *Acidi Carbolici.* | Carbolic acid, *oz.* 1; glycerine, *fl. oz.* 4. |
| *Acidi Gallici.* | Gallic acid, *oz.* 1; glycerine, *fl. oz.* 4. |
| *Acidi Tannici.* | Tannic acid, *oz.* 1; glycerine, *fl. oz.* 4. |
| *Amyli.* | Starch, *oz.* 1; glycerine, *fl. oz.* 8. |
| *Boracis.* | Borax in powder, *oz.* 1; glycerine, *fl. oz.* 4. |

**Infusa.**—There are twenty-eight formulæ for *Infusions* in the British Pharmacopœia. Infusions are prepared by pouring water upon vegetable substances, and allowing the latter to remain in the liquid for a certain length of time, varying according to circumstances. Infusions are preferred to decoctions when the substances to be operated upon are less dense, and when the desired principles can be abstracted at a temperature below the boiling point; also when we wish to preserve certain fugitive principles which impart an agreeable aroma, besides being otherwise valuable, and which would be driven off by boiling. The vegetable substances usually undergo some preliminary mechanical operation to render them more permeable; they are either *bruised*, *cut small*, *sliced*, *chipped*, or *coarsely powdered*. The temperature of the water is in twenty-four cases at the boiling point (212° Fahr.); in two instances at 120° Fahr.; and in two *cold*. The water is used either cold or below the boiling point, when that of a higher temperature would abstract noxious principles, as in the case of *Inf. Calumbæ.* The time prescribed for infusion varies from ten minutes to two hours, according to the facility with which the desired principles are abstracted. Infusions are to be strained so soon as the prescribed time is past, but they are often injured from carelessness in leaving the vegetable substances indefinitely in the liquid. *Inf. Cusso* is an exception, it is not strained at all; the solids and fluids are swallowed together. Infusions are prone to change, and should therefore be frequently renewed. "Infusion of senna, which would change in twelve hours in hot weather, will keep for several days perfectly good if one grain of nitre be dissolved in each ounce of the infusion" (SQUIRE).

In the preparation of ordinary infusions, no common plan can be adopted so as to make them keep. In consequence, considerable objection is urged against them in the present form. Those of Senega, Senna, Calumba, Cascarilla, &c., being so liable to decompose, as to render an ordinary 6 oz. or 8 oz. mixture of them oftentimes useless before it has been finished. It has been recommended to preserve them by filling into various-sized bottles, placing these in a pan of water on the fire, and allowing the water to boil round them for ten minutes or so, then speedily tying a piece of moistened bladder over each bottle (Mr. STEPHENSON). This is a modification of the method previously recommended by Mr. Alsop, who closed the bottles with well-ground and slightly-conical stoppers, smeared with wax. The object in both cases is to exclude air from the bottles. Treated in this way, they are said to keep good for months; but as so much depends on the season in which they are thus prepared, as well as on the kind of infusion, this method cannot be fully relied on. When ordinary infusions must be had, they should be prepared fresh, and, in warm weather especially, should be combined with some strong aromatic, and ordered in small quantities. To meet these difficulties, concentrated infusions have been introduced; but from the indifferent manner in which they are frequently prepared, they sometimes fail to give entire satisfaction. If Pharmaceutists, however, would individually turn their attention to this important class of preparations, instead of buying them ready made, concentrated infusions would be found to possess advantages the others could not claim. In the case of Calumba, Senega, Senna, and Cascarilla, they should be prepared in *cold* weather. The mode of preparation is simple and easily accomplished. The article to be infused should be bruised or roughly powdered, and the quantity used should be *eight times* that required to prepare the ordinary infusion. Let the mass be well moistened with cold water, and, after standing for three hours, pack closely in a convenient percolator. Add now 15 oz. of cold water for each pint intended to be made. To make one pint, the exact method of procedure would then be as follows :—Draw off half-a-pint of the concentrated infusion, and transfer this to a separate bottle. Continue to add water to the residue till the whole strength of the substance has been exhausted. Reduce this in a water-bath evaporator to the bulk of 5 oz., mix it with the 10 oz. of infusion originally obtained, and with the addition of 5 oz. of rectified spirit make 20 oz. of infusion; shake the whole, set aside for a few days, and filter. The process should be completed as rapidly as possible, in order to secure a first-rate preparation. The proportion of 1 part of such a preparation added to 7 of water forms an infusion of the ordinary strength (Mr. JAMES MACKENZIE). Infusions are chiefly used as vehicles for more active ingredients. They should be selected with the view of promoting the action of the combined medicines, or else of correcting their untoward effects. Some of them are given in a simple form, as *Inf. Cusso* and *Inf. Ergotæ.*

| | INFUSUM. | DISTILLED WATER. | | Minutes Infused. |
|---|---|---|---|---|
| | | Quantity. | Temp. | |
| *Anthemidis.* | Chamomile flowers, *oz.* ½. | *fl. oz.* 10 | 212° | 15 |
| *Aurantii.* | Bitter orange peel, *oz.* ½. | „ | „ | „ |
| *Aurantii Compositum.* | Bitter orange peel, cut small, *oz.* ¼; fresh lemon peel, cut small, *gr.* 60; cloves, bruised, *gr.* 30. | *fl. oz.* 10 | 212° | 15 |
| *Buchu.* | Buchu, *oz.* ½. . . . | „ | „ | 60 |
| *Calumbæ.* | Calumba, *oz.* ½. . . | „ | cold. | 60 |
| *Caryophylli.* | Cloves, *oz.* ¼. . . . | „ | 212° | 30 |
| *Cascarillæ.* | Cascarilla, *oz.* 1. . . | „ | „ | 60 |
| *Catechu.* | Catechu, *gr.* 160. .<br>Cinnamon, *gr.* 30. . | „ | „ | 30 |
| *Chiratæ.* | Chiretta, *oz.* ¼. . . . | „ | 120° | 30 |
| *Cinchonæ Flavæ.* | Yellow cinchona bark, *oz.* ½. | „ | 212° | 120 |
| *Cuspariæ.* | Cusparia, *oz.* ½. . . | „ | 120° | 120 |
| *Cusso.* | Kousso, *oz.* ½. . . . | *fl. oz.* 8 | 212° (not strained) | 15 |
| *Digitalis.* | Dried digitalis, *gr.* 30. | *fl. oz.* 10 | „ | 60 |
| *Dulcamaræ.* | Dulcamara, *oz.* 1. . . | „ | „ | 60 |
| *Ergotæ.* | Ergot, *oz.* ¼. . . . | „ | „ | 30 |
| *Gentianæ Compositum.* | Gentian root and bitter orange peel, of each *gr.* 60; fresh lemon peel, *oz.* ¼. . . . . | „ | 212° | 60 |

| | Infusum. | Distilled Water. | | |
|---|---|---|---|---|
| | | Quantity. | Temp. | Minutes Infused. |
| *Krameriæ.* | Rhatany, *oz.* ½. | *fl. oz.* 10 | 212° | 60 |
| *Lini.* | Linseed, *gr.* 160.<br>Fresh liquorice root, *gr.* 60. | ” | ” | 240 |
| *Lupuli.* | Hops, *oz.* ½. | ” | ” | 120 |
| *Maticæ.* | Matico, *oz.* ½. | ” | ” | 30 |
| *Quassiæ.* | Quassia chips, *gr.* 60. | ” | cold. | 30 |
| *Rhei.* | Rhubarb, *oz.* ¼. | ” | 212° | 60 |
| *Rosæ Acidum.* | Red-rose petals, *oz.* ¼.<br>Dilute sulph. acid, *fl. dr.* 1. | ” | ” | 30 |
| *Senegæ.* | Senega, *oz.* ½. | ” | ” | 60 |
| *Sennæ.* | Senna, *oz.* 1; ginger, *gr.* 30. | ” | ” | 60 |
| *Serpentariæ.* | Serpentary, *oz.* ¼. | ” | ” | 120 |
| *Uvæ Ursi.* | Bearberry leaves, *oz.* ½. | ” | ” | 120 |
| *Valerianæ.* | Valerian, *gr.* 120. | ” | ” | 60 |

**Linimenta.**—There are sixteen formulæ for *Liniments* in the British Pharmacopœia. Formerly, some of the *tinctures* were made of extra strength for external application; but all such are now classed with the liniments, and therefore all tinctures are for internal use. True *liniments* (or *embrocations*) are of oily or saponaceous consistency, suitable, as the name implies, to *anoint* or *besmear* the part to which they are applied. Several of the officinal liniments, however, have not this character; such as *Lin. Iodi,* which has no oleaginous constituent, and *Lin. Aconiti* and *Lin. Belladonnæ,* which have only their camphor to represent the oleaginous ingredient. These, therefore, are not suitable for application by friction, and if used alone, they must be carefully applied, in restricted quantity, by means of a camel's-hair brush, or if by inunction, they must be combined with other oily liniments. By a judicious combination of the officinal liniments with one another, or with other medicinal substances soluble in them, a great variety of magistral formulæ may be contrived to suit all cases in which the skin is the more suitable channel for the application of the medicine.

### Linimentum.

| | |
|---|---|
| *Aconiti.* | Powdered aconite root, *oz.* 20; camphor, *oz.* 1; rectified spirit, *Q.S.* makes *O* 1. |
| *Ammoniæ.* | Solution of ammonia, *fl. oz.* 1; olive oil, *fl. oz.* 3. |
| *Belladonnæ.* | Belladonna root, *oz.* 20; camphor, *oz.* 1; rectified spirit, *Q.S.* makes *O* 1. |

| | |
|---|---|
| *Calcis.* | Solution of lime, *fl. oz.* 2; olive oil, *fl. oz.* 2. |
| *Camphoræ.* | Camphor, *oz.* 1; olive oil, *oz.* 4. |
| *Camphoræ Compositum.* | Camphor, *oz.* 2½; oil of lavender, *fl. dr.* 1; strong solution of ammonia, *fl. oz.* 5; rectified spirit, *fl. oz.* 15. |
| *Chloroformi.* | Chloroform, *fl. oz.* 2; liniment of camphor, *fl. oz.* 2. |
| *Crotonis.* | Croton oil, *fl. oz.* 1; oil of cajuput and rectified spirit, of each, *fl. oz.* 3½. |
| *Hydrargyri.* | Ointment of mercury, *oz.* 1; solution of ammonia, *fl. oz.* 1; liniment of camphor, *fl. oz.* 1. |
| *Iodi.* | Iodine, *oz.* 1¼; iodide of potassium, *oz.* ½; camphor, *oz.* ¼; rectified spirit, *fl. oz.* 10. |
| *Opii.* | Tincture of opium, *fl. oz.* 2; liniment of soap, *fl. oz.* 2. |
| *Potassii Iodidi cum Sapone.* | Hard soap and iodide of potassium, of each *oz.* 1½; glycerine, *fl. oz.* 1; oil of lemon, *fl. dr.* 1; distilled water, *fl. oz.* 10. |
| *Saponis.* | Hard soap, *oz.* 2½; camphor, *oz.* 1¼; oil of rosemary, *fl. drs.* 3; rect. spirit, *fl. oz.* 18; distilled water, *fl. oz.* 2. |
| *Sinapis Compositum.* | Oil of mustard, *fl. dr.* 1; ethereal extract of mezereon, *gr.* 40; camphor, *gr.* 120; castor oil, *fl. drs.* 5; rectified spirit, *fl. oz.* 4. |
| *Terebinthinæ.* | Oil of turpentine, *fl. oz.* 16; soft soap, *oz.* 2; camphor, *oz.* 1. |
| *Terebinthinæ Aceticum.* | Oil of turpentine, *fl. oz.* 1; acetic acid, *fl. oz.* 1; liniment of camphor, *fl. oz.* 1. |

**Liquores.**—There are thirty-nine formulæ for *Solutions* in the British Pharmacopœia. It is convenient to remember that the strength of the following solutions is *four grains* of the active ingredient *to the ounce*—viz., *Arsenicalis, Arsenici Hydrochloricus, Atropiæ, Atropiæ Sulphatis, Morphiæ Acetatis, Morphiæ Hydrochloratis, Potassæ Permanganatis, Sodæ Arseniatis, Strychniæ,* and that of the *Perchloride of Mercury* is ½ grain to the ounce.

### LIQUOR.

| | |
|---|---|
| *Ammoniæ.* | Strong solution of ammonia, *O* 1; distilled water, *O* 2; *sp. gr.* 0·959. |
| *Ammoniæ Acetatis.* | Acetic acid, *fl. oz.* 10; carbonate of ammonia, *oz.* 3¼, or *Q.S.;* distilled water, *O* 2½. |
| *Ammoniæ Citratis.* | Citric acid, *oz.* 3; strong solution of ammonia, *fl. oz.* 2¾, or *Q.S.;* distilled water, *O* 1. |
| *Ammoniæ Fortior.* | Chloride of ammonium, *lb.* 3; slaked lime, *lb.* 4; distilled water, *fl. oz.* 32. |

| | |
|---|---|
| *Antimonii Chloridi.* | Black antimony, *lb.* 1; hydrochloric acid, *O* 4. |
| *Arsenicalis.* | Arsenious acid, *gr.* 80; carbonate of potash, *gr.* 80; compound tincture of lavender, *fl. drs.* 5; distilled water, *Q.S.* to make *O* 1; *sp. gr.* 1·009. |
| *Arsenici Hydrochloricus.* | Arsenious acid, *gr.* 80; hydrochloric acid, *fl. drs.* 2; distilled water, *Q.S.* to make *O* 1. |
| *Atropiæ.* | Atropia, *gr.* 4; rectified spirit, *fl. dr.* 1; distilled water, *fl. drs.* 7. |
| *Atropiæ Sulphatis.* | Sulphate of atropia, *gr.* 4; distilled water, *fl. oz.* 1. |
| *Bismuthi et Ammoniæ Citratis.* | Purified bismuth, *gr.* 430; nitric acid, *fl. oz.* 2; citric acid, *oz.* 2; solution of ammonia and distilled water, of each *Q.S.*; *sp. gr.* 1·122. |
| *Calcis.* | Slaked lime, *oz.* 2; distilled water, *C* 1. |
| *Calcis Chloratæ.* | Chlorinated lime, *lb.* 1; distilled water, *C* 1; *sp. gr.* 1·035. |
| *Calcis Saccharatus.* | Slaked lime, *oz.* 1; refined sugar, *oz.* 2; distilled water, *O* 1; *sp. gr.* 1·052. |
| *Chlori.* | Hydrochloric acid, *fl. oz.* 6; black oxide of manganese, *oz.* 1; distilled water, *fl. oz.* 34. |
| *Epispasticus.* | Cantharides, *oz.* 8; acetic acid, *fl. oz.* 4; ether, a sufficiency, makes *fl. oz.* 20. |
| *Ferri Perchloridi.* | Strong solution of perchloride of iron, *fl. oz.* 5; distilled water, *fl. oz.* 15. |
| *Ferri Perchloridi Fortior.* | Iron wire, *oz.* 2; hydrochloric acid, *fl. oz.* 12; nitric acid, *fl. drs.* 9; dist. water, *fl. oz.* 8; makes *fl. oz.* 10. |
| *Ferri Pernitratis.* | Fine iron wire, *oz.* 1; nitric acid, *fl. oz.* 4½; distilled water, *Q.S.*, makes *O* 1½. |
| *Ferri Persulphatis.* | Sulphate of iron, *oz.* 8; sulphuric acid, nitric acid, of each *fl. dr.* 6; distilled water, *fl. oz.* 12, or *Q.S.*, makes *fl. oz.* 11. |
| *Gutta-percha.* | Gutta-percha, *oz.* 1; chloroform, *fl. oz.* 8; carbonate of lead, *oz.* 1. |
| *Hydrargyri Nitratis Acidus.* | Mercury, *oz.* 4; nitric acid, *fl. oz.* 5; distilled water, *fl. oz.* 1½. |
| *Hydrargyri Perchloridi.* | Perchloride of mercury, chloride of ammonium, of each *gr.* 10; distilled water, *O* 1. |
| *Iodi.* | Iodine, *gr.* 20; iodide of potassium, *gr.* 30; distilled water, *fl. oz.* 1. |
| *Lithiæ Effervescens.* | Carbonate of lithia, *gr.* 10; water, *O* 1. |
| *Magnesiæ Carbonatis.* | Sulphate of magnesia, *oz.* 2; carbonate of soda, *oz.* 2½; distilled water, *Q.S.* |

| | |
|---|---|
| *Magnesiæ Citratis.* | Carbonate of magnesia, *gr.* 100; citric acid, *gr.* 200; syrup of lemons, *fl. oz.* ½; bicarbonate of potash, *gr.* 40; water, *Q.S.* |
| *Morphiæ Acetatis.* | Acetate of morphia, *gr.* 4; diluted acetic acid, *min.* 8; rectified spirit, *fl. drs.* 2; distilled water, *fl. drs.* 6. |
| *Morphiæ Hydrochloratis.* | Hydrochlorate of morphia, *gr.* 4; diluted hydrochloric acid, *min.* 8; rectified spirit, *fl. drs.* 2; distilled water, *fl. drs.* 6. |
| *Plumbi Subacetatis.* | Acetate of lead, *oz.* 5; oxide of lead, *oz.* 3½; distilled water, *O* 1, or *Q.S.*, makes *fl. oz.* 20. |
| *Plumbi Subacetatis Dilutus.* | Solution of subacetate of lead, *fl. drs.* 2; rectified spirit, *fl. drs.* 2; distilled water, *fl. oz.* 19½. |
| *Potassæ.* | Carbonate of potash, *lb.* 1; slaked lime, *oz.* 12; distilled water, *C* 1; *sp. gr.* 1·058. |
| *Potassæ Effervescens.* | Bicarbonate of potash, *gr.* 30; water, *O* 1. |
| *Potassæ Permanganatis.* | Permanganate of potash, *gr.* 80; distilled water, *O* 1. |
| *Sodæ.* | Carbonate of soda, *oz.* 28; slaked lime, *oz.* 12; distilled water, *C* 1; *sp. gr.* 1·047. |
| *Sodæ Arseniatis.* | Arseniate of soda (made anhydrous at a heat not above 300°), *gr.* 4; distilled water, *fl. oz.* 1. |
| *Sodæ Chloratæ.* | Carbonate of soda, *oz.* 12; black oxide of manganese, *oz.* 4; hydrochloric acid, *fl. oz.* 15; distilled water, *O* 2. |
| *Sodæ Effervescens.* | Bicarbonate of soda, *gr.* 30; water, *O* 1. |
| *Strychniæ.* | Strychnia, *gr.* 4; diluted hydrochloric acid, *min.* 6; rectified spirit, *fl. drs.* 2; dist. water, *fl. drs.* 6. |
| *Zinci Chloridi.* | Granulated zinc, *lb.* 1; hydrochloric acid, *fl. oz.* 44; solution of chlorine, *Q.S.*; carbonate of zinc; *oz.* ½, or *Q.S.*; distilled water, *O* 1. |

**Lotions.**—These are solutions of medicinal substances for external application. In practice they are very numerous, but they are chiefly prescribed *extempore.* Formulæ for two lotions are, however, contained in the British Pharmacopœia—viz., for black and yellow mercurial lotions.

### LOTIO.

| | |
|---|---|
| *Hydrargyri Flava.* | Perchloride of mercury, *gr.* 18; solution of lime, *fl. oz.* 10. |
| *Hydrargyri Nigra.* | Subchloride of mercury, *gr.* 30; solution of lime, *fl. oz.* 10. |

**Mellita.**—There are four formulæ for *Honeys* in the British Pharmacopœia. One is simply for the depuration of honey, the others are for compound preparations somewhat like syrups, the sugar being replaced by honey. *Mel Rosæ* is omitted.

### MEL.

| | |
|---|---|
| *Boracis.* | Borax, *gr.* 64; clarified honey, *oz.* 1. |
| *Depuratum.* | Honey, *lb.* 5; melt in a water-bath, and strain. |
| *Oxymel.* | Clarified honey, *oz.* 40; acetic acid, *fl. oz.* 5; distilled water, *fl. oz.* 5. |
| *Oxymel Scillæ.* | Vinegar of squill, *O* 1; clarified honey, *lb.* 2. |

**Misturæ.**—There are eleven formulæ for *Mixtures* in the British Pharmacopœia. These preparations are administered either alone or as adjuncts to and vehicles for other medicines. They are so prepared that they may be given in doses varying from half-an-ounce to two ounces.

### MISTURA.

| | |
|---|---|
| *Ammoniaci.* | Ammoniac, *oz.* ¼; distilled water, *fl. oz.* 8. |
| *Amygdalæ.* | Compound powder of almonds, *oz.* 2½; distilled water, *O* 1. |
| *Creasoti.* | Creasote, *min.* 16; glacial acetic acid, *min.* 16; spirit of juniper, *fl. dr.* ½; syrup, *fl. oz.* 1; distilled water, *fl. oz.* 15. |
| *Cretæ.* | Prepared chalk, *oz.* ¼; gum acacia, *oz.* ¼; syrup, *fl. oz.* ½; cinnamon water, *fl. oz.* 7½. |
| *Ferri Aromatica.* | Pale cinchona bark, *oz.* 1; calumba root, *oz.* ½; cloves, bruised, *oz.* ¼; fine iron wire, *oz.* ½; compound tincture of cardamoms, *fl. oz.* 3; tincture of orange peel, *fl. oz.* 7½; peppermint water, *Q.S.* |
| *Ferri Composita.* | Sulphate of iron, *gr.* 25; carbonate of potash, *gr.* 30; myrrh, *gr.* 60; refined sugar, *gr.* 60; spirit of nutmeg, *fl. drs.* 4; rose water, *fl. oz.* 9½. |
| *Gentianæ.* | Gentian root, *oz.* ¼; bitter orange peel, coriander fruit, of each, *gr.* 30; proof spirit, *fl. oz.* 2; distilled water, *fl. oz.* 8. |
| *Guaiaci.* | Guaiac resin, *oz.* ½; refined sugar, *oz.* ½; gum acacia, *oz.* ¼; cinnamon water, *O* 1. |
| *Scammonii.* | Resin of scammony, *gr.* 4; milk, *oz.* 2. |

| | |
|---|---|
| *Sennæ Composita.* | Sulphate of magnesia, *oz.* 4 ; extract of liquorice, *oz.* ½ ; tincture of senna, *fl. oz.* 2½ ; compound tincture of cardamoms, *fl. drs.* 10 ; infusion of senna, *Q.S.* to make *O* 1. |
| *Spiritus Vini Gallici.* | Spirit of French wine, cinnamon water, of each, *fl. oz.* 4 ; the yolk of two eggs ; refined sugar, *oz.* ½. |

**Mucilagines.**—There are three formulæ for *Mucilages* in the British Pharmacopœia. They are used to allay irritation of mucous membranes ; as vehicles for the combination of oils and resins with water in mixtures and enemata ; for suspending insoluble substances, as powders in mixtures ; and also for contributing to the constitution of lozenges.

### MUCILAGO.

| | |
|---|---|
| *Acaciæ.* | Gum acacia, *oz.* 4 ; distilled water, *fl. oz.* 6. |
| *Amyli.* | Starch, *gr.* 120 ; distilled water, *fl. oz.* 10. |
| *Tragacanthæ.* | Tragacanth, *gr.* 60 ; boiling dist. water, *fl. oz.* 10. |

**Pilulæ.**—There are twenty-two formulæ for *Pills* in the British Pharmacopœia. The pill is an exceedingly useful form of medicine, and has long existed. It is round, sufficiently cohesive to prevent crumbling, firm enough to retain its shape, dry enough to prevent its sticking to its neighbours or to the fingers, soft enough to be easy of digestion, from three to five grains in weight, consists of substances that are compatible and that are active in small bulk, and is covered with some vegetable powder, French chalk, magnesia, sugar, silver or gold leaf, or varnish, according to circumstances. Pills are perhaps more frequently prescribed *extemporaneously* and without reference to *officinal formulæ* than any other medicinal form. In constructing a *magistral* pill-formula, the following points are to be considered. The pill is a suitable form :—

1. When the ingredients are active in minute quantities.
2. When the ingredients for each dose do not amount to more than five, or at most six, grains in weight ; beyond that the pill becomes a *bolus*, and though the mass were divided into two or more parts, still remains an obnoxious quantity. There are, however, exceptional cases in which the relative weight of the ingredients, as to their bulk, is such as to allow of a pill weighing six or eight grains without attaining inconvenient size.
3. When a too sudden action of the medicine is to be avoided.
4. When the ingredients are such as cannot conveniently be given in

a fluid or more bulky form, whether from the difficulty of suspending them, or from the offensive odour or taste of the active substances.

5. When the ingredients do not cause a rapid change in the pill mass, whether by *deliquescence* or *efflorescence.*

Besides powders and mineral preparations, the more common active ingredients of pills are extracts, resins, gum-resins, balsams, and essential oils.

Having determined upon the active ingredients, the next point is the choice of an *excipient*:—

1. The excipient will be hard or soft, dry or moist, according to the nature of the other ingredients, its chief object being to impart tenacity. Powders and dry substances require a liquid or soft excipient, whilst liquid or moist substances require a dry or absorbent excipient.
2. *Dry Excipients.*—Inert powders, bread crumb, and dry extracts are the chief.
3. *Moist Excipients.*—Water, oils, syrups, honey, treacle, confection of roses, alcohol, tinctures, vinegar, mucilage, soap, soft extracts, &c.

Some excipients soon leave the pills very dry and hard, and are therefore not suitable when the pills are to be kept for some time; others soon give rise to mouldiness. The choice of an excipient is important, therefore, not only with the view of obtaining a due consistency, but also for the preservation of the mass in a plastic and unaltered condition. Sometimes the choice or quantity of an excipient is left to the dispenser, whilst at other times he is obliged to depart from the strict letter of the prescription, because the ingredients ordered are not capable of being formed into a pill. But the physician who has passed through a sufficient course of practical pharmacy is never straitened in his knowledge of what is required to form a suitable medicine, except, perhaps, occasionally as to some points of a chemical nature, which are only gradually coming to the knowledge of even thoroughly practical pharmaceutists. Sometimes a prescription is written for a single pill, with directions to the dispenser to send a certain number of such to the patient; at other times larger quantities are prescribed to form a mass, with directions to the dispenser to divide the quantity into so many pills. In both instances the latter plan is adopted by the dispenser. Pills have been coated with a variety of substances, with the view of preserving them from the atmosphere, and of protecting the patient from their disagreeable odour and taste, without, at the same time, interfering with their solubility in the alimentary canal.

Several substances have been used for this purpose, such as gelatine, collodion, albumen, Canada balsam, white wax, the tincture of tolu, lac, sandarach, &c. When a sufficient number of pills are sent to a patient to serve for longer than a few days, especially if they contain any fugitive ingredients, they should be sent in well-corked bottles, in which they keep much better than in boxes.

## PILULA.

| | |
|---|---|
| *Aloes Barbadensis.* | Barbadoes aloes, *oz.* 2; hard soap, *oz.* 1; oil of caraway, *fl. dr.* 1; confection of roses, *oz.* 1. |
| *Aloes et Assafœtidæ.* | Socotrine aloes, *oz.* 1; assafœtida, *oz.* 1; hard soap, *oz.* 1; confection of roses, *oz.* 1. |
| *Aloes et Ferri.* | Sulphate of iron, *oz.* 1½; Barbadoes aloes, *oz.* 2; compound powder of cinnamon, *oz.* 3; confection of roses, *oz.* 4. |
| *Aloes et Myrrhæ.* | Socotrine aloes, *oz.* 2; myrrh, *oz.* 1; saffron, *oz.* ½; confection of roses, *oz.* 2½. |
| *Aloes Socotrinæ.* | Socotrine aloes, *oz.* 2; hard soap, *oz.* 1; volatile oil of nutmeg, *fl. dr.* 1; confection of roses, *oz.* 1. |
| *Assafœtidæ (Galbani) Composita.* | Assafœtida, *oz.* 2; galbanum, *oz.* 2; myrrh, *oz.* 2; treacle, by weight, *oz.* 1. |
| *Cambogiæ Composita.* | Gamboge, *oz.* 1; Barbadoes aloes, *oz.* 1; compound powder of cinnamon, *oz.* 1; hard soap, *oz.* 2; syrup, *Q.S.* |
| *Colocynthidis Composita.* | Colocynth, *oz.* 1; Barbadoes aloes, *oz.* 2; scammony, *oz.* 2; sulphate of potash, *oz.* ¼; oil of cloves, *fl. drs.* 2; distilled water, *Q.S.* |
| *Colocynthidis et Hyoscyami.* | Compound pill of colocynth, *oz.* 2; extract of hyoscyamus, *oz.* 1. |
| *Conii Composita.* | Extract of hemlock, *oz.* 2½; ipecacuanha powder, *oz.* ½; treacle, *Q.S.* |
| *Ferri Carbonatis.* | Saccharated carbonate of iron, *oz.* 1; confection of roses, *oz.* ¼. |
| *Ferri Iodidi.* | Fine iron wire, *gr.* 40; iodine, *gr.* 80; refined sugar, *gr.* 70; liquorice root, *gr.* 140; distilled water, *min.* 50. |
| *Hydrargyri.* | Mercury, *oz.* 2; confection of roses, *oz.* 3; liquorice root, *oz.* 1. |
| *Hydrargyri Subchloridi Composita.* | Subchloride of mercury, sulphurated antimony, of each, *oz.* 1; guaiacum resin, *oz.* 2; castor oil, *fl. oz.* 1, or *Q.S.* |

| | |
|---|---|
| *Ipecacuanhæ cum Scillâ.* | Compound powder of ipecacuanha, *oz.* 3; squill and ammoniac, in powder, of each, *oz.* 1; treacle, *Q.S.* |
| *Phosphori.* | Phosphorus, *gr.* 2; balsam of tolu, *gr.* 120; yellow wax, *gr.* 60. |
| *Plumbi cum Opio.* | Acetate of lead, *gr.* 36; opium, *gr.* 6; confection of roses, *gr.* 6. |
| *Quiniæ.* | Sulphate of quinia, *gr.* 60; confection of hips, *gr.* 20. |
| *Rhei Composita.* | Rhubarb, *oz.* 3; socotrine aloes, *oz.* 2¼; myrrh, *oz.* 1½; hard soap, *oz.* 1½; oil of peppermint, *fl. drs.* 1½; treacle, by weight, *oz.* 4. |
| *Saponis Composita.* | Opium, *oz.* ½; hard soap, *oz.* 2; dist. water, *Q.S.* |
| *Scammonii Composita.* | Resin of scammony, resin of jalap, curd soap, of each, *oz.* 1; strong tincture of ginger, *fl. oz.* 1; rectified spirit, *fl. oz.* 2. |
| *Scillæ Composita.* | Squill, *oz.* 1¼; ginger, *oz.* 1; ammoniac, *oz.* 1; hard soap, *oz.* 1; treacle, by weight, *oz.* 2, or *Q.S.* |

**Pulveres.**—There are fifteen formulæ for *Powders* in the British Pharmacopœia. Powders are given either because it is desirable that the medicine should be administered in its integrity, in a form that can be readily attacked by the stomach, and, perhaps, that by simple mechanical action it should produce certain effects; or else, because the substances or the circumstances are not suited to the pill, mixture, or confection forms. The disadvantages attending their use are chiefly their bulk, rendering the dose disagreeable to the patient, that they generally contain a large quantity of inert matter, and that many of them are apt to undergo a deleterious change by keeping. The more minutely powders are divided the more powerful and prompt is their constitutional effect; the coarser they are the more prominent is their topical effect. Powders are either simple or compound; simple when the substance is single, compound when two or more are combined. Compound powders are to be prepared with great care; they should contain no deliquescent substance, and the ingredients should be thoroughly mixed. When they are kept in quantities, they should be occasionally well shaken, because the heavier particles, by frequent concussions of the vessel containing the powders, have a tendency to gravitate, leaving the lighter particles at the top. Powders that contain fugitive ingredients should be sent out in wide-mouthed bottles, well corked or stoppered, leaving it to the patient to apportion the doses; or if it be necessary to dispense such powders separately, they may be wrapped in an outer covering of waxed paper or tinfoil. Powders that are given in bulky doses, and that are not very active in their operations, may accumulate in the bowels if given for a length of time. To prevent this inconvenience an occasional laxative is to be prescribed.

### PULVIS.

| | |
|---|---|
| *Amygdalæ Compositus.*<br>*(Confectio, Conserva Amygdal.)* | Sweet almonds, *oz.* 8; refined sugar, *oz.* 4; gum acacia, *oz.* 1. |
| *Antimonialis.* | Oxide of Antimony, *oz.* 1; phosphate of lime, *oz.* 2. |
| *Catechu Compositus.* | Catechu, *oz.* 4; kino, *oz.* 2; rhatany, *oz.* 2; cinnamon, *oz.* 1; nutmeg, *oz.* 1. |
| *Cinnamomi Compositus.* | Cinnamon bark, cardamom seeds, and ginger, of each, *oz.* 1. |
| *Cretæ Aromaticus.*<br>*(Confectio Aromatica.)* | Cinnamon, *oz.* 4; nutmeg, *oz.* 3; saffron, *oz.* 3; cloves, *oz.* 1½; cardamom seeds, *oz.* 1; prepared chalk, *oz.* 11; refined sugar, *oz.* 25. |
| *Cretæ Aromaticus cum Opio.* | Aromatic powder of chalk, *oz.* 9¾; opium, *oz.* ¼. |
| *Elaterii Compositus.* | Elaterium, *gr.* 10; sugar of milk, *gr.* 90. |
| *Glycyrrhizæ Compositus.* | Senna, liquorice root, of each, *oz.* 2; sugar, *oz.* 6. |
| *Ipecacuanhæ Compositus.* | Ipecacuan, *oz.* ½; opium, *oz.* ½; sulphate of potash, *oz.* 4. |
| *Jalapæ Compositus.* | Jalap, *oz.* 5; acid tartrate of potash, *oz.* 9; ginger, *oz.* 1. |
| *Kino Compositus.* | Kino, *oz.* 3¾; opium, *oz.* ¼; cinnamon bark, *oz.* 1. |
| *Opii Compositus.* | Opium, *oz.* 1½; black pepper, *oz.* 2; ginger, *oz.* 5; caraway fruit, *oz.* 6; tragacanth, *oz.* ½. |
| *Rhei Compositus.* | Rhubarb, *oz.* 2; light magnesia, *oz.* 6; ginger, *oz.* 1. |
| *Scammonii Compositus.* | Scammony, *oz.* 4; jalap, *oz.* 3; ginger, *oz.* 1. |
| *Tragacanthæ Compositus.* | Tragacanth, *oz.* 1; gum acacia, *oz.* 1; starch, *oz.* 1; refined sugar, *oz.* 3. |

**Spiritus.**—There are sixteen formulæ for *Spirits* in the British Pharmacopœia. Some of the old spirits are omitted, some are altered in name and character, and a new class is formed, consisting of *Cajuput*, *Camphor*, *Juniper*, *Lavender*, *Peppermint*, *Nutmeg*, and *Rosemary*, made from the Essential oils, in the uniform proportion of one to forty-nine.

### SPIRITUS.

| | | Rect. Spirit. | Sp. Gr. |
|---|---|---|---|
| *Ætheris.* | Ether, *fl. oz.* 10. | *O* 1. | 0·809 |
| *Ætheris Nitrosi.* | Nitric acid, *fl. oz.* 3.<br>Sulphuric acid, *fl. oz.* 2.<br>Copper wire, *oz.* 2. | *Q.S.* | 0·845 |
| *Ammoniæ Aromaticus.* | Carbonate of ammonia, *oz.* 8.<br>Strong solution of ammon., *fl. oz.* 4.<br>Volatile oil of nutmeg, *fl. drs.* 4.<br>Oil of lemon, *fl. drs.* 6.<br>Water, *O* 3. | *O* 6. | 0·870 |
| *Ammoniæ Fœtidus.* | Assafœtida, *oz.* 1½.<br>Strong solution of ammon., *fl. oz.* 2. | *Q.S.* | |
| *Armoraciæ Compositus.* | Horseradish, *oz.* 20.<br>Bitter orange peel, *oz.* 20.<br>Nutmeg, *oz.* ½; proof spirit, *C* 1.<br>Water, *O* 2. | | |
| *Cajuputi.* | Oil of cajuput, *fl. oz.* 1. | *fl. oz.* 49. | |
| *Camphoræ.* | Camphor, *oz.* 1. | *fl. oz.* 9. | |
| *Chloroformi.* | Chloroform, *fl. oz.* 1. | *fl. oz.* 19. | 0·871 |
| *Juniperi.* | Oil of juniper, *fl. oz.* 1. | *fl. oz.* 49. | |
| *Lavandulæ.* | Oil of lavender, *fl. oz.* 1. | *fl. oz.* 49. | |
| *Menthæ Piperitæ.* | Oil of peppermint, *fl. oz.* 1. | *fl. oz.* 49. | |
| *Myristicæ.* | Volatile oil of nutmeg, *fl. oz.* 1. | *fl. oz.* 49. | |
| *Rectificatus.* | Alcohol, with 16 per cent. of water. | | 0·838 |
| *Rosmarini.* | Oil of rosemary, *fl. oz.* 1. | *fl. oz.* 49. | |
| *Tenuior.* | Distilled water, *O* 3. | *O* 5. | 0·920 |
| *Vini Gallici.* | Spirit distilled from French wine. | | |

**Succi.**—There are five formulæ for *Juices* in the British Pharmacopœia. Freshly expressed juices of plants were first introduced by Mr. Squire thirty years ago; five are now made officinal. In the preparation of juices from fresh plants, the hazard attending the drying of the plant is avoided, and also the dangers which attend evaporation in the process for extracts. To each three parts of the juice obtained by expression, one part of rectified spirit is added to preserve it from decomposition. The juices form an excellent illustration of the influences of climate, soil, and season upon medicinal plants, their value being greatly modified by these causes.

### SUCCUS.

| | |
|---|---|
| *Belladonnæ.* | Fresh leaves of belladonna, *lb.* 7; rectified spirit, 1 part to 3 of juice. |

| | |
|---|---|
| *Conii.* | **Fresh leaves of hemlock, *lb.* 7 ; rectified spirit, 1 part to 3 of juice.** |
| *Hyoscyami.* | **Fresh leaves of hyoscyamus, *lb.* 7 ; rectified spirit, 1 part to 3 of juice.** |
| *Scoparii.* | **Fresh broom tops, *lb.* 7 ; rect. spirit, 1 part to 3 of juice.** |
| *Taraxaci.* | **Dandelion root, *lb.* 7 ; rectified spirit, 1 part to 3 of juice.** |

**Suppositoria.**—There are seven formulæ for *Suppositories* in the British Pharmacopœia. Suppositories will be again considered when treating of the various channels by which medicines are introduced into the system.

### SUPPOSITORIA.

| | |
|---|---|
| *Acidi Carbolici cum sapone.* | Carbolic acid, *gr.* 12 ; curd soap, *gr.* 180 ; starch, *Q.S.* ; makes 12. |
| *Acidi Tannici.* | Tannic acid, *gr.* 36 ; benzoated lard, *gr.* 44 ; white wax, *gr.* 10 ; oil of theobroma, *gr.* 90 ; makes 12. |
| *Acidi Tannici cum sapone.* | Tannic acid, *gr.* 36 ; glycerine of starch, *gr.* 50 ; curd soap, *gr.* 100 ; starch, *Q.S.* ; makes 12. |
| *Hydrargyri.* | Ointment of mercury, *gr.* 60 ; benzoated lard and white wax, of each, *gr.* 20 ; oil of theobroma, *gr.* 80 ; makes 12. |
| *Morphiæ.* | Hydrochlorate of morphia, *gr.* 6 ; benzoated lard, *gr.* 64 ; white wax, *gr.* 20 ; oil of theobroma, *gr.* 90 ; makes 12. |
| *Morphiæ cum sapone.* | Hydrochlorate of morphia, *gr.* 6 ; glycerine of starch, *gr.* 50 ; curd soap, *gr.* 100 ; starch, *Q.S.* ; makes 12. |
| *Plumbi Composita.* | Acetate of lead, *gr.* 36 ; opium, in powder, *gr.* 12 ; benzoated lard, *gr.* 42 ; white wax, *gr.* 10 ; oil of theobroma, *gr.* 80 ; makes 12. |

**Syrupi.**—There are eighteen formulæ for *Syrups* in the British Pharmacopœia. Some of the old syrups are omitted, and there are, moreover, additions and alterations. The chief difficulties attending the preservation of syrups are their tendencies to ferment and become mouldy if too weak, and to crystallize when too strong. In order to prevent these results, the Pharmacopœia directs, in most cases, that the product of each syrup to be obtained from the ingredients ordered shall be of a certain fixed weight, thus determining at the same time their consistency. Good syrups are of a certain weight in proportion to the ingredients used—of a certain density—are free from crystals and muddiness—are made with the purest sugar—and must be kept in a cool place, and in vessels nearly full. Bottles half full, or vessels loosely covered, tend to injurious changes through crystallization of the sugar. When they are to be kept for some time they may be poured into bottles whilst hot, the bottles being immediately well corked and then inverted. Syrups are charged with medicinal substances, and are used either alone, for the sake of their active ingredients, or as adjuvants to other medicines, to preserve them, to give them an agreeable flavour, or to promote their activity.

## SYRUPUS.

| | | Refined Sugar. | Product. | Sp. Gr. |
|---|---|---|---|---|
| *Syrupus.* | Distilled water, *O* 2. | 5lb. | 7½lb. | 1·330 |
| *Aurantii.* | Tincture of orange peel, *fl. oz.* 1; syrup, *fl. oz.* 7. | | | |
| *Aurantii Floris.* | Orange-flower water, *fl. oz.* 8; distilled water, *fl. oz.* 16, or *Q.S.* | 3lb. | 4½lb. | 1·330 |
| *Chloral.* | Hydrate of chloral, *gr.* 80; distilled water, *fl. drs.* 4; simple syrup, *Q.S.* | | | |
| *Ferri Iodidi.* | Fine iron wire, *oz.* 1; iodine, *oz.* 2; dist. water, *fl. oz.* 13. | 28oz. | 2lb. 11oz. | 1·385 |
| *Ferri Phosphatis.* | Granulated sulphate of iron, *gr.* 224; phosphate of soda, *gr.* 200; acetate of soda, *gr.* 74; dilute phosphate acid, *fl. oz.* 5½; distilled water, *fl. oz.* 8. | 8 oz. | *fl. oz.* 12, by measure. | |
| *Hemidesmi.* | Hemidesmus, *oz.* 4; boiling distilled water, *O* 1. | 28 oz. | 2lb. 10oz. | 1·335 |
| *Limonis.* | Fresh lemon peel, *oz.* 2; lemon juice, *O* 1. | 2¼lb. | 3½lb. | 1·340 |
| *Mori.* | Mulberry juice, *O* 1; rectified spirit, *fl. oz.* 2½. | 2lb. | 3lb. 6oz. | 1·330 |
| *Papaveris.* | Poppy capsules, freed from seeds, *oz.* 36; boiling dist. water, *Q.S.*; rectified spirit, *fl. oz.* 16. | 4lb. | 6½lb. | 1·320 |
| *Rhamni.* | Buckthorn juice, *O* 4; ginger and pimento, of each, *oz.* ¾; rectified spirit, *fl. oz.* 6. | 5lb. or *Q.S.* | | 1·320 |

| | | Refined Sugar. | Product. | Sp. Gr |
|---|---|---|---|---|
| *Rhei.* | Rhubarb root, coriander fruit, of each, *oz.* 2; rectified spirit, *fl. oz.* 8.; distilled water, *fl. oz.* 24. | 24oz. | | |
| *Rhœados.* | Red poppy petals, *oz.* 13; dist. water, *O* 1, or *Q.S.;* rect. spirit, *fl. oz.* 2½. | 2¼lb. | 3lb.10oz. | 1·330 |
| *Rosæ Gallicæ.* | Dried red-rose petals, *oz.* 2; boiling dist. water, *O* 1. | 30oz. | 2lb.14oz. | 1·335 |
| *Scillæ.* | Vinegar of squill, *O* 1. | 2½lb. | | 1·330 |
| *Sennæ.* | Senna, *oz.* 16; oil of coriander, *min.* 3; dist. water, *O* 5, or *Q.S.;* rect. spirit, *fl. oz.* 2. | 24oz. | 2lb. 10oz. | 1·310 |
| *Tolutanus.* | Balsam of tolu, *oz.* 1¼; dist. water, *O* 1; or *Q.S.* | 2lb. | 3lb. | 1·330 |
| *Zingiberis.* | Strong tincture of ginger, *fl. drs.* 6; syrup, *fl. oz.* 19. | | | |

**Tincturæ.**—There are sixty-eight formulæ for *Tinctures* in the British Pharmacopœia. Different kinds of spirit are used, as menstrua, in the preparation of the tinctures, according to the solubility of the active principles to be abstracted from the substances from which they are prepared. *Rectified and proof spirits, aromatic spirit of ammonia, and spirit of ether* are used. Some of the tinctures prepared by the stronger spirits assume a milky appearance when they are diluted with water, the spirit being no longer able to keep the resinous or oily ingredients in solution. To obviate this result, when given in the form of mixture, the addition of mucilage is necessary to suspend the insoluble substances. The method of preparing tinctures has been considerably modified by the British Pharmacopœia, a change which has not given general satisfaction. Before the publication of the Pharmacopœia, there were two rival processes, *maceration* and *percolation*, and there was not a little speculation as to which of these would be adopted. The result has been termed a *compromise.* Sixteen of the tinctures (*marked b. in the following arrangement*) are prepared by the old process of *maceration.* Forty-five of the tinctures (*marked a.*) are prepared by a union of the two processes, *maceration* followed by *percolation.* The seven tinctures marked [illegible] are prepared by simply dissolving the ingredients in the spirit.

**British** *Pharmacopœia Process for the forty-five Tinctures marked a.*

**Macerate** for forty-eight hours, with fifteen ounces of the spirit, in a close vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, pour into the percolator the remaining five ounces of the spirit. As soon as the percolation is completed, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient spirit to make one pint."

*Process for the Sixteen Tinctures marked b.*—"Macreate for seven days, filter (strain, express), and add sufficient spirit to make one pint," except *Spt. Lavand. Co.*, in which case rectified spirit is added to make two pints.

### TINCTURA.

*a.* Macerate 48 hours and percolate; *b.* Macerate 7 days; *c.* Dissolve in the spirit. Product, *O* 1. Except **O* 2.

| | | SPIRIT. | |
|---|---|---|---|
| | | Rectified. | Proof. |
| *a. Aconiti.* | Aconite root, *oz.* 2½. | *O* 1 | |
| *b. Aloes.* | Socotrine aloes, *oz.* ½.<br>Extract of liquorice, *oz.* 1½. | | *Q.S.* |
| *a. Arnicæ.* | Arnica root, *oz.* 1. | *O* 1 | |
| *b. Assafœtidæ.* | Assafœtida, *oz.* 2½. | *Q.S.* | |
| *a. Aurantii.* | Bitter orange peel, *oz.* 2. | | *O* 1 |
| *b. Aurantii Recentis.* | Bitter orange peel, fresh, *oz.* 6. | *O* 1 | |
| *a. Belladonnæ.* | Belladonna leaves, *oz.* 1. | | *O* 1 |
| *b. Benzoini Composita.* | Benzoin, *oz.* 2.<br>Prepared storax, *oz,* 1½.<br>Balsam of tolu, *oz.* ½.<br>Socotrine aloes, *gr.* 160. | *O* 1 | |
| *a. Buchu.* | Buchu, *oz.* 2½. | | *O* 1 |
| *a. Calumbæ.* | Calumba, *oz.* 2½. | | *O* 1 |
| *b. Camphoræ Composita.* (*Tinct. Opii Camphorata.*) | Opium, *gr.* 40.<br>Benzoic acid, *gr.* 40.<br>Camphor, *gr.* 30.<br>Oil of anise, *fl. dr.* ½. | | *O* 1 |
| *c. Cannabis Indicæ.* | Extract of Indian hemp, *oz.* 1. | *O* 1 | |
| *a. Cantharidis.* | Cantharides, *oz.* ¼. | | *O* 1 |
| *a. Capsici.* | Capsicum, *oz.* ¾. | *O* 1 | |
| *a. Cardamomi Composita.* | Cardamoms, *oz.* ¼.<br>Caraway, *oz.* ¼.<br>Raisins, *oz.* 2.<br>Cinnamon, *oz.* ½.<br>Cochineal, *gr.* 60. | | *O* 1 |
| *Cascarillæ.* | Cascarilla, *oz.* 2½. | | *O* 1 |
| *astorei.* | Castor, *oz.* 1. | *O* 1 | |

| | | Spirit. | |
|---|---|---|---|
| | | Rectified. | Proof. |
| a. *Catechu.* | Catechu, *oz.* 2½.<br>Cinnamon, *oz.* 1. | | *O* 1 |
| a. *Chiratæ.* | Chiretta, *oz.* 2½. | | *O* 1 |
| c. *Chloroformi Composita.* | Chloroform, *fl. oz.* 2; Compound tincture of cardamoms, *fl. oz.* 10. | *fl. oz.* 8. | |
| a. *Cinchonæ Composita.* | Pale cinchona bark, *oz.* 2.<br>Bitter orange peel, *oz.* 1.<br>Serpentary, *oz.* ½.<br>Saffron, *gr.* 60.<br>Cochineal, *gr.* 30. | | *O* 1 |
| a. *Cinchonæ Flavæ.* | Yellow cinchona bark, *oz.* 4. | | *O* 1 |
| a. *Cinnamomi.* | Cinnamon, *oz.* 2½. | | *O* 1 |
| b. *Cocci.* | Cochineal, *oz.* 2½. | | *O* 1 |
| a. *Colchici Seminum.* | Colchicum seed, *oz.* 2½. | | *O* 1 |
| a. *Conii.* | Hemlock fruit, *oz.* 2½. | | *O* 1 |
| a. *Croci.* | Saffron, *oz.* 1. | | *O* 1 |
| a. *Cubebæ.* | Cubebs, *oz.* 2½. | *O* 1 | |
| a. *Digitalis.* | Digitalis, *oz.* 2½. | | *O* 1 |
| a. *Ergotæ.* | Ergot, *oz.* 5. | | *O* 1 |
| c. *Ferri Acetatis.* | Solution of persulphate of iron, *fl. oz.* 2½; acetate of potash, *oz.* 2. | *Q.S.* | |
| c. *Ferri Perchloridi.* | Strong solution of perchloride of iron, *fl. oz.* 5. | *fl. oz.* 15.<br>(*sp. gr.* 0·992) | |
| a. *Gallæ.* | Galls, *oz.* 2½. | | *O* 1 |
| a. *Gentianæ Composita.* | Gentian, *oz.* 1½.<br>Bitter orange peel, *oz.* ¾.<br>Cardamoms, *oz.* ¼. | | *O* 1 |
| b. *Guaiaci Ammoniata.* | Guaiac resin, *oz.* 4.<br>Aromatic spirit of ammonia, *Q.S.* | | |
| a. *Hyoscyami.* | Hyoscyamus leaves, *oz.* 2½. | | *O* 1 |
| c. *Iodi.* | Iodine, *oz.* ½; iodide of potassium, *oz.* ¼. | *O* 1 | |
| a. *Jalapæ.* | Jalap, *oz.* 2½. | | *O* 1 |
| b. *Kino.* | Kino, *oz.* 2. | *O* 1 | |
| a. *Krameriæ.* | Rhatany, *oz.* 2½. | | *O* 1 |
| a. *Laricis.* | Larch bark, *oz.* 2½. | *O* 1 | |
| b. & c. *Lavandulæ Composita.* | Oil of lavender, *fl. dr.* 1.<br>Oil of rosemary, *min.* 10.<br>Cinnamon, *gr.* 150.<br>Nutmeg, *gr.* 150.<br>Red sandal wood, *gr.* 300. | *O* 2* | |

| | | SPIRIT. | |
|---|---|---|---|
| | | Rectified. | Proof. |
| *a. Limonis.* | Fresh lemon peel, *oz.* 2½. | | *O* 1 |
| *a. Lobeliæ.* | Lobelia, *oz.* 2½. | | *O* 1 |
| *b. Lobeliæ Ætherea.* | Lobelia, *oz.* 2½; spirit of ether, *O* 1. | | |
| *a. Lupuli.* | Hop, *oz.* 2½. | | *O* 1 |
| *a. Myrrhæ.* | Myrrh, *oz.* 2½. | *O* 1 | |
| *a. Nucis Vomicæ.* | Nux vomica, *oz.* 2. | *O* 1 | |
| *b. Opii.* | Opium, *oz.* 1½. | | *O* 1 |
| *b. Opii Ammoniata.* | Opium, in coarse powder, *gr.* 100; saffron and benzoic acid, of each, *gr.* 180; oil of anise, *fl. dr.* 1; strong solution of ammonia, *fl. oz.* 4. | *fl. oz.* 16. | |
| *a. Pyrethri.* | Pellitory root, *oz.* 4. | *O* 1 | |
| *b. Quassiæ.* | Quassia wood, *oz.* ¾. | | *O* 1 |
| *b. Quiniæ.* | Sulphate of quinia, *gr.* 160; tincture of orange peel, *O* 1. | | |
| *c. Quiniæ Ammoniata.* | Sulphate of quinia, *gr.* 160; solution of ammonia, *oz.* 2½. | | *oz.* 17½ |
| *a. Rhei.* | Rhubarb, *oz.* 2; cardamoms, *oz.* ¼; coriander, *oz.* ¼; saffron, *oz.* ¼. | | *O* 1 |
| *a. Sabinæ.* | Savin, *oz.* 2½. | | *O* 1 |
| *a. Scillæ.* | Squill, *oz.* 2½. | | *O* 1 |
| *a. Senegæ.* | Senega, *oz.* 2½. | | *O* 1 |
| *a. Sennæ.* | Senna, *oz.* 2½; raisins, *oz.* 2; caraway, *oz.* ½; coriander, *oz.* ½. | | *O* 1 |
| *a. Serpentariæ.* | Serpentary, *oz.* 2½. | | *O* 1 |
| *a. Stramonii.* | Stramonium seeds, *oz.* 2½. | | *O* 1 |
| *a. Sumbul.* | Sumbul root, *oz.* 2½. | | *O* 1 |
| *c. Tolutana.* | Balsam of tolu, *oz.* 2½. | *Q.S.* | |
| *a. Valerianæ.* | Valerian, *oz.* 2½. | | *O* 1 |
| *b. Valerianæ Ammoniata.* | Valerian, *oz.* 2½; aromatic spirit of ammonia, *O* 1. | | |
| *a. Veratri Viridis.* | Green hellebore root, *oz.* 4. | *O* 1 | |
| *a. Zingiberis.* | Ginger, *oz.* 2½. | *O* 1 | |
| *a. Zingiberis Fortior.* | Ginger, *oz.* 10. | *Q.S.* | |

**Trochisci.**—There are ten formulæ for *Lozenges* in the British Pharmacopœia. This form of medicine is adopted from the Edinburgh Pharmacopœia. The product in each case is 720 lozenges.

TROCHISCI.

| | Product, 720 Lozenges. | Refined Sugar. oz. | Gum Acacia. oz. | Mucilage of Gum. fl. oz. | Distilled Water. Quantity. fl. oz. |
|---|---|---|---|---|---|
| *Acidi Tannici.* | Tannic acid, *gr.* 360; tincture of tolu, *fl. oz.* ½. | 25 | 1 | 2 | 1 |
| *Bismuthi.* | Subnitrate of bismuth, *gr.* 1440; carbon. of magnesia, *oz.* 4; precipitated carb. of lime, *oz.* 6. | 29 | 1 | 2 | (rose water.)<br>*Q.S.* |
| *Catechu.* | Pale catechu, *gr.* 720. | 25 | 1 | 2 | *Q.S.* |
| *Ferri Redacti.* | Reduced iron, *gr.* 720. | 25 | 1 | 2 | 1 or *Q.S.* |
| *Ipecacuanhæ.* | Ipecacuanha, *gr.* 180. | 25 | 1 | 2 | 1 or *Q.S.* |
| *Morphiæ.* | Hydroch. of morphia, *gr.* 20; tincture of tolu, *fl. oz.* ½ | 24 | 1 | *Q.S.* | ½ |
| *Morphiæ et Ipecacuanh.* | Hydroch. of morphia, *gr.* 20; ipecacuan, *gr.* 60; tincture of tolu, *fl. oz.* ½. | 24 | 1 | *Q.S.* | ½ |
| *Opii.* | Extract of opium, *gr.* 72; tincture of tolu, *fl. oz.* ½; extract of liquorice, *oz.* 6. | 16 | 2 | | *Q.S.* |
| *Potassæ Chloratis.* | Chlorate of potash, *gr.* 3600. | 25 | 1 | 2 | 1 or *Q.S.* |
| *Sodæ Bicarbonatis.* | Bicarbonate of soda, *gr.* 3600. | 25 | 1 | 2 | 1 |

**Unguenta.**—There are thirty-three formulæ for *Ointments* in the British Pharmacopœia. The old *cerates* are either omitted or merged in the ointments, the name having been abandoned. There are several omissions, additions, and alterations amongst the ointments. The consistence of ointments may be modified by altering the quantity of wax or oil—the former giving stiffness, the latter softness, to the preparation. In the dispensing of ointments, the following particulars are to be observed :—1. To reduce the active ingredients to an impalpable state, so that there may be no *grittiness* in the ointment. 2. This reduction may be effected by powdering, if the substance be capable of it, or, otherwise, by dissolving it in a few drops of spirit or other menstruum. 3. To distribute the active ingredients uniformly through the ointment. Ointments are used only externally, sometimes simply as emollients, at other times as vehicles for the most powerful remedies ; *e.g., Unguentum Aconitiæ.*

| | UNGUENTUM. | Prep. Lard. oz. | Simple Oint. oz. |
|---|---|---|---|
| *Aconitiæ.* | Aconitia, *gr.* 8; rect. spirit, *fl. dr.* ½. | 1 | |
| *Antimonii Tartarati.* | Tartarated antimony, *oz.* ¼. | | 1 |
| *Atropiæ.* | Atropia, *gr.* 8; rect. spirit, *fl. dr.* ½. | 1 | |
| *Belladonnæ.* | Extract of belladonna, *gr.* 80. | 1 | |
| *Cadmii Iodidi.* | Iodide of cadmium, *gr.* 62. | | 1 |
| *Cantharidis.* | Cantharides, *oz.* 1; yellow wax, *oz.* 1; olive oil, *fl. oz.* 6. | | |
| *Cetacei.* | Spermaceti, *oz.* 5; white wax, *oz.* 2; almond oil, *O* 1, or *Q.S.* | | |
| *Creasoti.* | Creasote, *fl. dr.* 1. | | 1 |
| *Elemi.* | Elemi, *oz.* ¼. | | 1 |
| *Gallæ.* | Galls, *gr.* 80; benzoated lard, *oz.* 1. | | |
| *Gallæ cum Opio.* | Ointment of galls, *oz.* 1; opium, *gr.* 32. | | |
| *Hydrargyri.* | Mercury, *lb.* 1; prepared suet, *oz.* 1. | 16 | |
| *Hydrargyri Ammoniati.* (*Unguentum Præcip. Albi.*) | Ammoniated mercury, *gr.* 62. | | 1 |
| *Hydrargyri Compositum.* | Ointment of mercury, *oz.* 6; yellow wax, olive oil, of each, *oz.* 3; camphor, *oz.* 1½. | | |
| *Hydrargyri Iodidi Rubri.* | Red iodide of mercury, *gr.* 16. | | 1 |
| *Hydrargyri Nitratis.* (*Unguentum Citrinum.*) | Mercury, by weight, *oz.* 4; nitric acid, *fl. oz.* 12; olive oil, *fl. oz.* 32. | 15 | |
| *Hydrargyri Oxidi Rubri.* (*Unguen. Hydrar. Nitrico Oxidi.*) | Red oxide of mercury, *gr.* 62; yellow wax, *oz.* ¼; oil of almonds, *oz.* ¾. | 1 | |
| *Hydrargyri Subchloridi.* | Subchloride of mercury, *gr.* 80. | | |
| *Iodi.* | Iodine, *gr.* 32; iodide of potas., *gr.* 32; proof spirits, *fl. dr.* 1. | 2 | |
| *Picis Liquidæ.* | Tar, *oz.* 5; yellow wax, *oz.* 2. | | |
| *Plumbi Acetatis.* | Acetate of lead, *gr.* 12; benzoated lard, *oz.* 1. | | |
| *Plumbi Carbonatis.* | Carbonate of lead, *gr.* 62. | | 1 |
| *Plumbi Iodidi.* | Iodide of lead, *gr.* 22. | | 1 |
| *Plumbi Subacetatis Compositum.* | Solution of subacetate of lead, *fl. oz.* 6; camphor, *gr.* 60; white wax, *oz.* 8; oil of almonds, *O* 1. | | |
| *Potassæ Sulphuratæ.* | Sulphurated potash, *gr.* 30. | 1 | |
| *Potassii Iodidi.* | Iodide of potassium, *gr.* 64; carbonate of potash, *gr.* 4; distilled water, *fl. dr.* 1. | 1 | |

| | | Prep. Lard. *oz.* | Simple Oint. *oz.* |
|---|---|---|---|
| *Resinæ.* | Resin, *oz.* 8; yellow wax, *oz.* 4. | | 16 |
| *Sabinæ.* | Fresh savin, *oz.* 8; yellow wax, *oz.* 3. | 16 | |
| *Simplex.* | White wax, *oz.* 2; almond oil, *fl. oz.* 3. | 3 | |
| *Sulphuris.* | Sublimed sulphur, *oz.* 1; benzoated lard, *oz.* 4. | | |
| *Sulphuris Iodidi.* | Iodide of sulphur, *gr.* 30. | 1 | |
| *Terebinthinæ.* | Oil of turpentine, *fl. oz.* 1; resin, *gr.* 60; yellow wax, *oz.* ½. | ½ | |
| *Veratriæ.* | Veratria, *gr.* 8; olive oil, *fl. dr.* ½. | 1 | |
| *Zinci.* | Oxide of zinc, *gr.* 80; benzoated lard, *oz.* 1. | | |

**Vapores.**—In conformity with a growing impression that inhalation is a mode of administering remedies, more especially for affections of the chest, which is at once agreeable and effective, an entirely new class of formulæ has been introduced into the British Pharmacopœia, fixing the proportions of certain medicinal agents when used for inhalations. Vessels made of stoneware, suitable for this purpose, are now to be procured from most druggists. The formulæ for inhalations, five in number, are—

### VAPOR.

| | |
|---|---|
| *Acidi Hydrocyanici.* | Diluted hydrocyanic acid, *min.* 10-15; water, *fl. dr.* 1. |
| *Chlori.* | Chlorinated lime, *oz.* 2; water (cold), *Q.S.* |
| *Conii.* | Extract of hemlock, *gr.* 60; solution of potash, *fl. dr.* 1; distilled water, *fl. drs.* 10, *min.* 20, of mixture on a sponge. |
| *Creasoti.* | Creasote, *min.* 12; boiling water, *fl. oz.* 8. |
| *Iodi.* | Tincture of iodine, *fl. dr.* 1; distilled water, *fl. oz.* 1. |

**Vina.**—There are eleven formulæ for *Wines* in the British Pharmacopœia. The medicated wines hold medicinal substances in solution, and are used much in the same way as the tinctures. Sherry is the menstruum in most of the officinal wines, and the quality of the preparation will depend upon its soundness. It should contain 17 or 18 per cent. of alcohol. Orange wine should contain about 12 per cent. of alcohol.

## VINUM.

Product *O* 1. Except Aloes *O* 2

| | | Sherry. | |
|---|---|---|---|
| *Aloes.* | Socotrine aloes, *oz.* 1½; cardamoms, *gr.* 80; ginger, *gr.* 80. | *O* 2 | digest 7 days. |
| *Antimoniale.* | Tartarated antim., *gr.* 40. | *O* 1 | dissolve. |
| *Aurantii.* | Wine made in Britain, by fermentation of a saccharine solution, to which the fresh peel of the bitter orange has been added. | | |
| *Colchici.* | Colchicum corm, *oz.* 4. | *O* 1 | macerate 7 days. |
| *Ferri.* | Fine iron wire, *oz.* 1. | *O* 1 | macerate 30 days. |
| *Ferri Citratis.* | Citrate of iron and ammonia, *gr.* 160; orange wine, *O* 1. | | dissolve, and let stand 3 days. |
| *Ipecacuanhæ.* | Ipecacuan, *oz.* 1. . . | *O* 1 | macerate 7 days. |
| *Opii.* | Extract of opium, *oz.* 1; cinnamon bark, cloves, of each, *gr.* 75. | *O* 1 | Do. do. |
| *Quiniæ.* | Sulphate of quinia, *gr.* 20; citric acid, *gr.* 30; orange wine, *O* 1. | | macerate 3 days. |
| *Rhei.* | Rhubarb root, *oz.* 1½; canella alba bark, *gr.* 60. | *O* 1 | macerate 7 days. |
| *Xericum.* | Sherry,—a Spanish wine. | | |

Besides the general titles of officinal formulæ, others are employed to distinguish certain classes of medicine, such as *Collyrium*, or eye-wash; *Elixir*, a term formerly applied to compound tinctures—*e.g.*, *Paregoric Elixir* (*Tinct. Camph. Comp.*, P.L.), *Elixir Proprietatis* (*Tinct. Aloes Comp.*, P.L.), *Daffy's Elixir* (*Tinct. Sennæ Comp.*, P.L.), &c.; *Emulsion*, a mixture containing oleaginous or resinous ingredients held in suspension by means of yolk of egg, mucilage, or sugar; *Essential oil*, an oil obtained from odoriferous plants by distillation or expression. There are thirty oils in the British Pharmacopœia, of which, twenty-one are distilled and eight expressed from vegetable substances, the remaining one being extracted from the fresh liver of the cod by a steam heat, not exceeding 180° F. The term *Julep* is synonymous with *Mistura;* the present *Aqua Camphoræ* was formerly called *Mistura Camphoræ* or *Camphor Julep*. *Linctus* is a thin electuary, such as can be *licked* (*lingo*) off the spoon.

*Granular Effervescing Powders.*—These are a recent invention, and form a distinct class of elegant and useful remedies. They consist of an active medicinal substance in union with the *Citro-tartrate of Soda.* The ingredients *Citric Acid, Tartaric Acid,* and *Bicarbonate of Soda,* finely divided, are mixed together and heated until, by the water of crystallization of the citric acid, the ingredients are converted into a plastic mass. This is dried and granulated by passing it through a coarse sieve. During the operation a part only of the carbonic acid escapes, the remainder being fixed in the solid granular particles, each of which, when dissolved in water, parts with more of the gas, so that when a large quantity of the substance is stirred in water, it gives rise to a brisk sparkling effervescence. Preparations of magnesia, iron, quinine, lithia, &c., have been made in combination with granular effervescing powders.

*Granules* were first prepared by *Messrs. Homolle & Quevenne.* They consist of the more active medicinal substances enveloped in sugar. They are usually made with very active remedies. The *Granules of Digitaline* contain one-sixtieth of a grain of Digitaline in each.

*Capsules.*—Capsules of gelatine, sugar, or gum are employed to envelop medicines which are apt to create disgust by their odour or taste. Copaiva, cubebs, castor oil, and many other remedies may be so given.

## MAGISTRAL FORMULÆ OR PRESCRIPTIONS.

We come now to the consideration of matters with which the physician alone has to do. Hitherto we have had the assistance of the *collector*, the *cultivator*, the *merchant*, and the *dispenser* of drugs. We have been learning from experienced practical teachers how to *select* and *collect* the *Materia Medica* from their sources in nature; how to reproduce certain of them by *cultivation;* how to *preserve* them; how to *prepare* them for use; and, by the ordinances of the British Pharmacopœia, how *to reduce them to forms most convenient for application.* We have been chiefly in consultation with that invaluable physician's friend, the *Pharmaceutical Chemist.* But we have now passed out of his domain; he will still attend to our wants, but he can no longer help us to a decision. Our responsibility is henceforward *undivided.* We are alone with our patient: we have examined him; and, having pronounced his malady, we come to the momentous question, *Why, what, when,* and *how* shall we prescribe for him? This quadruple question involves the consideration of several important points, such as—1. The meaning of the terms *properties*, *forces*, *actions*, and *effects* of *medicines*. 2. The *modus operandi* and *classification* of medicines. 3. The *locality* of the action of medicines. 4. The several methods of *applying* medicines to the patient. 5. The circumstances which *modify* the actions of medicines. 6. *The construction of the Prescription.*

Now, it is plain, that to deal with these questions in any beyond the briefest possible manner, would completely change at once the character and usefulness of the *Note-Book;* and that to attempt a brief exposition of the doctrines concerned in them, whilst it would assuredly lead to misconceptions, could be of little or no practical value. I shall therefore give no more than a mere sketch of the subject here; the object of the *Note-Book* being to awaken the student's interest to these important matters, and to show what is to be learned from the lectures and from extended treatises, rather than to supply the details of the subject.

**1. The Properties, Forces, Actions, and Effects of Medicines.**—All medicines are endowed with *properties* which, when quickened into activity, are called *forces.* The properties and forces of medicines are divisible into three classes:—*a. Physical*, or *Mechanical; b. Chemical; c. Dynamical*, or *vital.*

We understand by the physical properties of medicines all those qualities by which we recognise them without the aid of chemistry; and of these properties, such as are appreciable by the senses, as form, colour, odour, and taste, are distinguished by the term *sensible*, or, as the French call them, *organoleptic*, properties. The chemical properties of substances are those which relate to their composition and to the changes which take place in their constitution by their mutual action upon one another.

The *dynamical* properties of medicines are those by which they produce in the living organism certain effects which are directly referable neither to physical nor chemical force. We have examples of this property in the action of certain inorganic bodies upon each other, of which, perhaps, the action of the magnet upon a steel rod, previously destitute of polarity, is the simplest illustration. If a steel rod or needle, in which there is no magnetic manifestation, be suspended horizontally from its centre, in such a manner that the suspending agent does not control its movements, the bar or needle may be brought to a state of rest with its extremities pointed in any direction, and will remain in that position until some external force is applied to overcome its inertia. But if a magnet be passed over the needle from end to end, and the needle be again suspended, we shall find that a change has taken place. It will no longer remain quietly in the position in which it may be placed, as before, but as soon as the force that placed it in any other position is removed, it will spontaneously assume the position of having one of its extremities pointing to the north and the other to the south. But the needle is otherwise the same as before: we can appreciate no physical or chemical change in its constitution; nor can we discover the manifestation of any physical or chemical force in the magnet; and the force which has evidently been in operation is therefore simply called *dynamical* (*δύναμις, power*). So it is also with certain medicines: they are applied to the organism, and a manifest change takes place; but as we can neither refer the change to a physical nor chemical action, we say, in the absence of a more satisfactory explanation, that it is due to the *dynamical* or *vital* properties of the agent.

When a medicine is brought into relationship with the organism, its properties are quickened, its forces come into operation, the *action* of the remedy is manifested, and there follows a series of results which may collectively be termed the *medicinal effect*. This effect is of a twofold character: first, there is the effect produced by the direct contact of the medicine with the part to which it is applied; and, second, there is the result produced by the reaction of the organism as a consequence of the first effect. Effects are also divisible into *Primary*, or *Physiological*, and *Secondary*, or *Therapeutical*.

*Physiological*, *Primary*, or *Immediate* effects are the results which may be produced by medicines when applied to the organism during health. But health is not essential to their manifestation; they may arise in the presence of disease, and may either precede or accompany therapeutical effects. Thus, arsenious acid, if given in long-continued small doses, may give rise to a sensation of heat in the *primæ viæ*, nausea, purging, headache, cough, irregularity in the circulation, and many other indications of its presence in the system of a healthy person; and these are physiological effects. But if the person to whom the arsenic was given were suffering from a chronic cutaneous affection—such as *lepra* or *psoriasis*, the physiological effects might still arise, but the chain of events which led to the removal of the disease would constitute the *Secondary* or *Therapeutical* effect.

**2. The Modus Operandi and Classification of Medicines.**—It has been the desire of every age, as it is still the wish of every individual, to offer some explanation of the manner in which the results proceeding from certain causes are produced. The physician has not been less active in his endeavours than others to trace the footsteps of the cause to its effect. No physician would ever administer a dose of medicine without being able not only to foretell its effects, but also to demonstrate the *modus operandi*—that is, the method pursued by the medicine to fulfil its mission—if he could. No intelligent physician can ever give a dose of medicine without either supposing that he does understand the manner of its operation, or sighing for the explanation. And so strong is the desire of every observant mind to account for the effects witnessed during the treatment of disease, that we can scarcely be surprised at the numerous attempts that have been made, from time to time, to offer some reasonable explanation of the conduct of medicines during their presence in the human system. Some of these explanations have been mere assumptions, conclusions hastily drawn, for the sake of offering a plausible interpretation of certain phenomena—they are mere *hypotheses;* whilst others, founded upon philosophical principles, deserve the dignity of *theories.*

The actions of medicines have been referred to their physical, chemical, and dynamical or vital properties. By their physical and chemical properties, medicines may act in the living organism in the same way as they would act upon each other, under favourable circumstances, apart from living beings; but when it is said that medicines act *dynamically*, it is meant that they produce their effects by an unexplained influence over *vitality*, either by increasing, diminishing, or otherwise altering the powers of life. But the action of a medicine, it is said, may be of a compound character: it may be partly physical, or partly chemical, and partly dynamical or vital; and the action is then termed either *physico-vital* or *chemico-vital*, as the case may be. And when the action is in no way referable either to the physical or chemical force, it is said to be *purely vital.*

When we consider this complex subject at length, however, we shall find that not one of the theories offered in support of these assertions has been sufficient to afford a universal explanation of the actions of remedies. Many of them, it is true, are still unrefuted, and even now afford plausible explanations of the *modus operandi* of certain medicines; the chief objection urged against them being, not that they are altogether unreasonable and improbable, but that they are individually pushed too far. But not only has no single theory satisfied the intense desire for an explanation of the actions of medicines, but even the sum of all the theories leaves still a want which neither experience nor speculation has hitherto been able to supply. Nor is it surprising, when we consider the inconsistency of the grounds of argument. It is a very difficult matter to found a satisfactory theory upon the basis of individual experience; for even during a long life of careful observation, the physician can scarcely expect to accumulate a sufficient number of cases, in all respects identical, upon which we can establish a definite *law* or *principle*. The experience of ages has failed in this; and the accumulation of statistics, however numerous, unless they be, as indeed they scarcely can be, in all respects identical, will never reduce the science of therapeutics to exactness. It is the vital element—the ψυχὴ, πνεῦμα, *archæus*, *anima*, vital principle, call it what you please—that is the disturbing cause in all such calculations of the physicist, the chemist, and even of the vitalist; and so long as that remains beyond human control, there can be no absolute certainty in the practice of medicine.

One of the most difficult points that the physician has to determine at the bedside, is the exact effect of a medicine. A certain drug was administered yesterday, a certain change is observable to-day; is the change wholly, partly, or at all due to the medicine? One of the chief sources of fallacy in the practice of medicine is the ready application of the *post hoc, propter hoc* argument: a medicine has been given, a change follows, *therefore* the medicine *caused* the change. It is to this readiness to call mere sequences *effects* that we owe the short-lived remedies which occasionally startle the world as by a flash and a loud report, and then gradually vanish like the smoke of a cannon. But if it be a difficult matter to recognise the results of the medicine *after*, how much more difficult must it be to predicate its effects *before*, its administration. In his *Essay on the Human Understanding*, John Locke affords the following illustration of the *iatro-mathematical* speculations. Reviving an old physical doctrine, he says—"If we could discover the figure, size, texture, and motions of the minute constitutional parts of any two bodies, we should know, without trial, several of their operations, one upon another, as we do now the properties of the square or a triangle. Did we know the mechanical affections of the particles of rhubarb, hemlock, opium, and a man, as a watchmaker does those of a watch, whereby it performs its operations, and of a file, which, by rubbing on them, will alter the figure of any of the wheels, we should be able to tell beforehand that rhubarb will purge, hemlock kill, and opium make a man sleep." Very true, if the file, wheels, rhubarb, hemlock, opium, and man were alike simple and steadfast in constitution; but they are not. The wheels of the watch and the file are constant and unchanging mechanical implements, having the same "affections" from day to day and year to year; whereas the mechanical and chemical "affections" of rhubarb, hemlock, and opium, and the mechanical, chemical, and, above all, the *vital* "affections" of the man are ever changing, and are in no two ndividuals alike. The same file will affect fifty different wheels in exactly the same manner, if applied in all cases alike, and fifty files applied equally to one wheel will produce identical effects. But the same sample of opium may affect fifty different individuals in as many different ways, according to the age, sex, development, temperament, idiosyncrasy, conditions of organs and their functions, the presence of disease, and other modifying causes present in each case; and it may, moreover, affect the same individual in different ways, according to the predominance of one or other of the above circumstances at different periods of life. And again, if fifty doses of opium were given, in succession, to one individual, from samples of the drug prepared under as many different circumstances of climate, soil, elevation, season, mode of collecting, &c., each dose might produce a different effect. Man is not a machine, to be operated upon as a watchmaker deals with a watch. When the watch stops, the watchmaker can readily enough replace the broken spring, and set it in motion again; but the springs of life are of Divine origin, not of human manufacture. The heart beats and the lungs breathe, unaided by a single human thought, and when their movements cease, no human power can revive them. Analogy offers at best but a feeble support to the doctrines of the actions of medicines, even when it is drawn from experiments made upon the lower animals; but it is utterly inadequate when it compares the highest of God's creatures with the ordinary products of that creature's workmanship—animated beings with things inanimate. No comparison of a man with a watch or a steam-engine can constitute a proof of the silent and invisible changes which occur in the human frame; nor can any results obtained by manipulations in the workshop of the mechanic, or the chemical laboratory, be accepted as serious indications of the treatment proper to the vital economy.

But we have also another important element to consider in reference to the organism: suppose, for the sake of brevity, we speak of disease as *disordered vitality*, then we find that there exists in the organism itself an innate tendency to the *restoration of order*, by means of a force which we call *vis medicatrix naturæ*—the *healing power of nature.* Most physicians pay great deference to this force; but in pursuing this course, the vitalists have often gone as far wrong as the physicists and the chemists. The indications of nature are, doubtless, of the utmost value, and the Latin phrase is probably near the truth that says, *medicus curat, natura sanat morbos*—the physician *cures*—that is, takes care of the patient, in the sense, if we may use analogy, in which the pilot takes care of a vessel in a storm—but nature *heals* the disease. What, perhaps, is most wanted, in the present state of Therapeutics, is a combined effort on the part of physicians to ascertain, by means of extensive and accurate observation, how far the unaided efforts of nature are capable of restoring to health; or, in other words, what is the *natural history* of diseases. If anything approaching to scientific accuracy were ever effected in this direction, it would be then comparatively easy to judge correctly regarding the value of any particular medicine or mode of treatment. But in the present state of our knowledge, we are not warranted in adopting the exclusive doctrines of Hippocrates or of Hahnemann. We owe a deep debt of gratitude to the zealous labourers in this department of medical investigation; but even they would scarcely ask the student to commit himself at once to their doctrines, and to receive them as the unchallenged expositions of the actions of medicines. All that can be demanded of him is, that he shall give them his careful consideration, reserving the expression of his opinions regarding them for maturer years, when credulity and scepticism, after many a conflict, shall have found a common level in his mind. In the lectures devoted to this part of the subject, the doctrines of the various schools are usually reviewed; but they are too bulky to admit of being placed in the *Note-Book*. And here I would only further add a single caution to the student against the hasty acceptance of speculations, whether of the physicist, the chemist, or the vitalist, which, from an acquaintance with but the two ends of the chain—the initial cause and the ultimate effect—profess to solve the mystery of those intervening links which lie hidden in the recesses of the vital economy.

Seeing that the actions of medicines are not fully understood, it is obvious that no trustworthy *classification* can at present be established upon the basis of their *modus operandi*. To a certain extent, perhaps, this most desirable method of classification may be available; but until much that is now obscure with respect to the actions of medicines be brought to light, its use must necessarily be very limited. Nevertheless, a classification of some kind is necessary. We can readily conceive the difficulty that would be constantly felt in a large library, in which the books were placed at random upon the shelves, without reference to number, name, or subject. To facilitate the consultation of books various plans are adopted: they may be arranged alphabetically, according to the names of the authors, or according to the titles of the books; or they may be classified according to the subjects treated of—*history* here, *geography* there; here *biography*, there *novels*, and so on.

So it is also with medicines. To place them at random upon the shelves of the pharmaceutist, or to treat of them in a disorderly manner in books, would cause great confusion and loss of time in searching for individual remedies, whilst, at the same time, the memory would be clumsily overloaded, and many useful medicines would, from time to time, fall out of mind, and be lost on the journey of life. To obviate such difficulties, medicines have been arranged in classes, according to the views entertained of the relative value of classifications by the different writers on Materia Medica. Almost every writer on the subject has his own peculiar classification, either entirely novel, or merely an emendation upon the arrangement of a previous author. Hence there is a great variety of classifications, none of which, however, is perfect, because the basis of the classification is in no instance adapted to the whole list of Materia Medica; whilst, on the other hand, few, if any, medicines can be restricted to a single class. And so we find, upon comparing the classifications of different authors, that the classes which are adopted by some are ignored by others; and that even those classes which have received general adoption are frequently represented in the various works by different medicines.

In some works the medicinal substances are arranged simply in alphabetical order, like the words in a dictionary. This plan, like the rest, has its advantages and disadvantages. It is a convenient form for consultation, because the book can be opened at the place where the substance is to be found without reference to an index. In works thus arranged, we generally meet with a definite, concise, and exhaustive account of the substance in one spot, and are spared the annoyance of frequent references to other parts of the work. The disadvantages are, chiefly, that it prevents continuous reading, whilst it does not in all cases supersede the necessity for an index, seeing that medicines possessed of several names can only be classified by one of them.

In other works, the classification is made with reference to the physical properties of medicines; obviously a very imperfect plan. One of the conceits of the physicists was, that every medicinal substance afforded, in one or another of its external characters, an indication of its therapeutic value, and a guide to its exhibition. In this hypothesis originated the absurd *Doctrine* of *Signatures*, the promoters of which maintained that every medicinal substance presented in one of its sensible properties a likeness to some part of the organism, that these similarities were the results of *astral* influences, and that such relations of colour, shape, &c., were trustworthy indications of the applicability of the medicine to the diseases of the part which it resembled. Each of such marks or characters was called a *signature*. Thus, the root of the *mandrake* was recommended as a cure for sterility, because of its supposed resemblance to the human form; *turmeric* was a cure for jaundice, because of its yellow colour; *poppies* for diseases of the head; *aristolochia* for uterine diseases, and so forth; whilst a covering of red cloth, being the same colour as the blood, served to attract that fluid to the surface of the body.

But even more recently the sensible qualities of medicines have been proposed as indications of their therapeutic value, and classifications of medicines have been made according to their colour, taste, and smell. That substances which are allied by taste or smell, or both, are frequently also alike in medicinal action, is undeniable; bitter substances are generally used as tonics; substances with a fetid odour are often used as antispasmodics; sweetish mucilaginous substances as demulcents; harshly-tasting substances as astringents; and hot-tasting substances as carminatives. With respect to colour, we have no well-marked classes. Other therapeutic indications are held to exist in the form, weight, &c., of remedies; as examples of which are quoted the hairs of the pods of *Mucuna pruriens*, silica, glass, the woody fibre of vegetable substances given in bulk, quicksilver, the class of demulcents, &c. We should, however, scarcely adventure a couple of drachms of sulphate of zinc, or of oxalic acid, merely because these compounds are not unlike Epsom salts; nor, in short, should we be justified in the use of any untried substance, simply from an acquaintance with its sensible properties.

Still another method of classification upon physical or mechanical principles remains to be adverted to; namely, that which is based upon the theory of the *modus operandi* of medicines by their influence upon the *osmotic force*. It is supposed that there are certain medicines which act by controlling the transference of fluids through living animal membranes, either by altogether preventing the passing of the fluids, or by determining the intensity of the *endosmotic* or *exosmotic* current. If this idea be well founded, it becomes a matter of the deepest importance, seeing that life itself is sustained by a regular interchange of nutrient and effete matters, conducted through intervening membranes by means of the physico-vital process of *osmosis*. This question is intimately related to that of *absorption*, and requires more space for its elucidation than the *Note-Book* allows.

Again, affinity of botanical characters has been proposed as an indication of similarity of medicinal virtues. This analogy may certainly be traced to a considerable extent, but it is by no means a safe guide, and no physician would be justified in administering an untried remedy on the sole ground that it was derived from a family containing several useful medicinal plants. The umbelliferæ are generally harmless, yet the order contains hemlock, a most deadly poison; the Solanaceæ, even when separated by a more accurate botanical analysis from the Atropaceæ, with which they used to be classified, still contain the potato, a valuable and nutritious esculent, and alongside of it, the bitter-sweet, an active poison; and we would err very far did we administer aloes, squill, and asparagus indiscriminately, because they are all derived from the natural family *Liliaceæ.* Moreover, substances possessed of similar medicinal properties may be collected from different natural families, such as digitalis (*Scrophulariaceæ*), tobacco (*Atropaceæ*), and lobelia (*Lobeliaceæ*), which are all depressents.

Again, the chemical relations of substances have been proposed as indications of their therapeutic value; but here, too, we shall find that the exceptions so far outnumber the instances upon which the law i based, as to render this mode of classifying medicines also well-nigh practically useless. There is, however, something far more intricate and subtle about the chemical than about the physical relations of substances, and this we may pause for a moment to inquire into. The important differences to be observed between the physical and chemical forces are chiefly these: that whilst the physical force can be manifested both in similar and dissimilar bodies, the chemical force can be developed only between dissimilar bodies; and that whilst the physical force does not, as a general rule, permanently alter the properties of the bodies subjected to its influence, the chemical force generally produces a permanent change. And it is important to remember especially one point with reference to the chemical force in relation to medicinal substances; namely, that we cannot foretell the result of its manifestation. Bodies, either elementary or compound, which might be administered alone with impunity, may, if given together, in consequence of the manifestation of the force of *chemical affinity*, produce most disastrous results. The elementary bodies, carbon, hydrogen, and nitrogen, for example, may be applied to the organism individually, within certain limits, without producing any injurious effects; and in various combinations, they enter into the human constitution. Judging by the individual characters of these elementary bodies, we could not possibly infer that they were able to assume a form in which they are capable of destroying life, even when exhibited in exceeding small quantity. No mere mechanical mixture could effect this change; but we know from experience, that by *chemical affinity* these elements can assume the form of HCN, one of the swiftest and most destructive poisons, *prussic acid.* Carbon, hydrogen, nitrogen, and oxygen, which are in themselves comparatively harmless bodies, assume very different characters, according to the relations which they bear to each other when influenced by chemical affinity. The following chemical formulæ are not very unlike each other, they are constituted of the same elements, and differ only in the number of atoms of each—$C_{21}H_{22}N_2O_2$; $C_{17}H_{19}NO_3H_2O$; $C_{20}H_{24}N_2O_2$; $C_{32}H_{52}N_2O_8$—and yet how different are their medicinal properties; the first represents *strychnia*, the second *morphia*, the third *quinia*, and the fourth *veratria*. Moreover, substances which are alike, not only in the number, but also in the proportions of their constituents, may differ widely in their medicinal and physical as well as their other chemical properties; thus the formula $C_{10}H_{16}$ represents equally the oils of turpentine, lemons, oranges, bergamot, chamomile, cloves, thyme, and many others. *Isomerism* (*ἴσος*, *equal*, *μέρος* part) is no greater proof of identity of medicinal properties than *isomorphism* (*ἴσος*, equal, *μορφὴ*, *form*). Substances which are made up of constituents alike in quality and quantity, may differ widely in their properties, according to their molecular arrangement. By analysis, we can ascertain the number and proportion of the elementary constituents present in a substance, but not the form in which the molecules are arranged; chemistry has not yet revealed this mystery in the economy of nature.

It must be obvious, therefore, even from the few examples quoted, that the proposition to judge of the medicinal activity of substances simply by their physical or chemical properties cannot be sustained to any great extent. Neither *isomerism* nor *isomorphism*, neither similarity in constitution nor likeness in form, can enable us unexceptionably to foretell the action of a medicine, even upon purely chemical or mechanical principles, supposing all other circumstances to be constant; much less will it enable us to foresee the nature of the effects that will be produced under the influence of the compound *chemico-vital* or *physico-vital* forces. But, on the other hand, in favour of chemical classifications, it is to be borne in mind that there are certain analogies of chemical properties and medicinal actions which cannot be overlooked. We have examples of these in the mineral and vegetable acids; in the *halogens*, iodine, chlorine, and bromine; in the alkalies, potash, soda, and lithia; in the alkaline earths, magnesia, lime, baryta, and strontia, &c.; but even in these instances the *identity* is not equal to the *diversity* of medicinal action.

Again, medicines have been classified according to the parts of plants or animals from which they are derived, an arrangement that has been but little respected.

Again, medicines may be classified according to their physiological and therapeutical action upon the lower animals, as ascertained by observation or experiment. Of all the plans hitherto mentioned this is by far the most trustworthy, because in it, for the first time, the vital element is brought into operation. But still it would be very unsafe to administer a substance to a human being upon no better authority than that it had previously been applied to a horse, a dog, or a rabbit, with benefit or impunity. Sheep, goats, and cows eat the leaves of *hyoscyamus niger* with impunity. Enormous quantities of arsenic, tartar emetic, and belladonna have been given to horses without producing untoward effects. Albers gave morphia and opium to rabbits in doses that would have destroyed several human beings, but they produced no narcotic results. The anatomical differences between man and the lower animals are quite sufficient to nullify the actions of medicines in the latter as criteria of their effects upon the former. Nevertheless, observations and experiments made upon the lower animals are of great value, for by them many facts have been ascertained with respect to the conduct of different medicines, and of the same medicine under different circumstances, in the animal economy, which could not have been elicited by experiment upon human beings.

Of the methods now mentioned, it may be stated that, neither individually nor collectively, are they sufficient to constitute a sound basis for the classification of medicines, nor trustworthy indications of the actions and effects of medicinal substances in the human system. Like the symptoms of disease, each has a relative significance which may, and ought to be, duly estimated, but singly cannot be relied on.

Then, finally, medicines may be classified according to their physiological and therapeutical actions in the human system. These are the only satisfactory methods of classification, and they are still very deficient. We cannot enter here into these questions, because they involve all the considerations of the actions of medicines; but this may be said, that even when these most desirable classifications are constructed, they must necessarily give rise to many exceptions, varying not only with the *individuality* of the patient, but also with the characters of the disease. The action of a medicine upon a person in health cannot be accepted as the criterion of its action in the presence of disease; nor can the action of a medicine be certainly predicated in any individual case. It may be modified by many circumstances, pertaining equally to the patient and the drug itself, as we shall show more fully hereafter. And again, medicines are not to be restricted to a single class, for they act in a variety of ways, according to the manner in which they are administered: thus, tartar emetic may be a diaphoretic, expectorant, or emetic; quinine, a tonic, or a febrifuge; calomel, an alterative, a cathartic, or a sialagogue; squill, an emetic, cathartic, diuretic, or expectorant; or all may be given as poisons.

Medicines may be classified physiologically, either according to effects, which are obvious, or according to the changes which they are supposed to produce within the system, but of which there is no immediate external manifestation. Of the former, we have an instance in that comprehensive class called *evacuants*, comprising substances which cause discharges from one or other part of the body: if from the skin, they are *diaphoretics;* if from the nose, *errhines;* if from the bowels, *cathartics;* if from the lungs, *expectorants*. Of the latter we have examples in *alteratives* and *tonics*.

It is easier to classify medicines physiologically than therapeutically, because it is easier experimentally to trace the cause of aberration than that of restoration. The natural condition of the body is health —a state, it is true, that cannot be maintained without a due attention to the necessities of life, but which, nevertheless, under favourable circumstances, is its normal state; whilst disease is a departure from the normal condition, and is caused either by a positive injury, as by a stroke or a poison, or by deprivation, as of food, heat, light, exercise, &c. But there is always a tendency, sometimes feeble and unavailing, but invariably present—the *vis medicatrix naturæ*—an innate tendency to return to the normal condition of health; and it is the conflicting influence of this *healing power of nature* that renders a therapeutical classification the more difficult.

No medicine is worthy of a place in either of these classifications until it has repeatedly, and under a variety of circumstances, manifested its qualifications; and these are more readily tested physiologically than therapeutically. An illustration will explain this more clearly. A medicine is administered to a person in health, and soon afterwards it is observed that his pulse beats less rapidly than before; the dose is repeated, and the pulsations are still slower. The experiment is frequently repeated under a variety of circumstances, and upon several persons of different qualities, and the result is invariably a reduction in the number of pulsations. Such a medicine may then be fairly classed with *arterial sedatives*. Again, the same medicine is administered as frequently to the same number of persons, all suffering from acute inflammation and an abnormally rapid circulation. A reduction in the rate of arterial pulsation follows; but in this case the proof of the sedative influence of the medicine is not so strong, simply because it is in the direction of, whereas in the former case it was opposed to, the tendency of nature. Or, to take another illustration; suppose a ball to be hanging quiescently at the end of a string, and it is desired to prove that two instruments, when alternately brought near to it, have an opposite effect upon it, the one gradually setting it in motion, the other gradually bringing it to a state of rest. By repeatedly observing the fact, that on the approach of one of the instruments the ball begins to move, at first gently, and then more rapidly, we should conclude that the instrument was the cause of the motion. But of the influence of the second instrument to bring the ball gradually to a state of rest, we should be more doubtful, simply because, if left alone, the ball would of itself become quiescent. In the one case, the proof is positive, in the other negative. Nevertheless, we are not to despair of attaining a therapeutical classification. We shall not arrive at it by mere speculation, not by *ex parte* chemical, physiological, or pathological theories, but by close practical observation. All our trustworthy remedies have been introduced and confirmed clinically, experimentally, or, if you will, empirically, and not hypothetically. Practical therapeutics can be studied only at the bedside, where alone the student, aided by chemistry, physiology, and pathology, can learn to be a wise and prudent physician. The trustworthy practitioner is the chemist, physiologist, pathologist, therapeutist, all in one ; it is only when the mere man of science approaches the bedside that we encounter those specious, and often captivating, speculations, which have hitherto retarded, rather than promoted, the practice of medicine.

**3. The Locality of the Action of Medicines.**—When a medicine is applied to the organism, its action may be manifested either at the point of contact, or at a distant part of the body, or in both places. When the action of the medicine is developed at the point of contact, it is said to be *topical* or *local;* when at a distant part, it is said to be *remote.* The topical action of a medicine is modified chiefly by two circumstances—the quality and state of aggregation of the medicine, and the sensibility, and qualities of the secretions, of the part to which it is applied. A medicine may exhibit a topical and no perceptible remote action; or contrariwise, a remote action without any perceptible local effects.

Various explanations have been urged as to the manner in which medicines produce their remote effects. The chief are these : *By absorption into the circulation, by nervous agency or sympathy, by contiguity of organs, by continuity of tissue, and by revulsion;* and doubtless, to a limited extent, medicines may manifest their remote action through any of these channels ; but greater interest attaches to the two former methods—the nervous agency and the circulation—for it is between the supporters of them that the keenest controversies have arisen. The majority of medicines probably exercise their remote effects by being absorbed into the circulation by means of the veins, and, to a less extent, by the lymphatics and lacteals; but there are some medicines whose remote effects may be due partly or entirely to nervous agency.

It is probable that no solid particles can be taken into the circulation; and, therefore, it is generally stated that medicines to be absorbed must be either given in a state of solution, or must be capable of solution in the secretions of the alimentary canal, or other parts to which they are applied. They must be soluble, too, without decomposition; or if decomposition takes place, the resulting compounds must be capable of producing the desired effects. The agents by which medicines, administered in a solid form, may be rendered soluble, or by which they may be otherwise operated upon, when administered in the usual way by the digestive apparatus, are the *acids*, *alkalies*, *alkaline chlorides*, and other peculiar principles of the gastric and intestinal juices.

**4. Channels by which Medicines are introduced into the System.**—All parts of the body are capable of absorbing medicinal substances, but not with equal energy and rapidity. And, moreover, the several tissues to which medicines are applied, exercise, through their secretion, a modifying influence upon the remedies. Medicines may be introduced through mucous membranes, skin, and subjacent cellular tissue, serous membranes, wounds, and vessels.

*Mucous Membrane.*—Of this there are two tracts:—1. In relation with the eyes, ears, nose, pulmonary apparatus, and alimentary canal. 2. Genito-urinary.

1. *The Gastro-enteric, Pulmonary, &c., tract of Mucous Membrane.*—Of the larger tract, the mucous membrane of the stomach and intestines is most frequently used for the exhibition of medicines, chiefly on account of the facility of the application, the readiness with which absorption takes place, and the intimate relationship between these parts and the rest of the body. But the stomach may be rendered unavailable by obstinate refusal or inability to perform the act of deglutition, by obstinate regurgitation or vomiting, arising from irritability of the membrane or more serious disease of the organs, by antipathy or repugnance, by the production of some untoward physiological result, or by the action of the gastric fluids rendering the medicine inert. Moreover, it is sometimes necessary to approach the system by two avenues at once, as by simultaneous internal administration and inunction, &c.

The mucous membrane of the rectum and colon being less capable of absorption, and less sympathetic in its relations than that of the stomach and smaller intestines, is also inferior as a channel for the introduction of medicines. Nevertheless, when, from the above-mentioned causes, the mucous membrane of the upper part of the alimentary canal is unavailable, medicines may be applied with advantage by the rectum. There are, moreover, cases in which, independently of such obstructions, this part of the canal is preferable. Medicines are applied to the rectum both for local and remote purposes, such as to soothe the part, to remove irritating substances and promote defæcation, or to relieve a distant part by revulsion. The neighbouring organs, as the bladder and the uterus with its appendages, are also more readily affected through the rectum. Very frequently the pain arising from an inflammatory affection of the uterus, its appendages, or of the bladder, is relieved immediately by an opiate suppository; whereas opiates administered by the mouth exerted little or no effect.

Differences of opinion exist as to the relative quantity of medicine to be given by the rectum; the absorbent powers being less, some have said that the dose might be as much as four or five times greater; whilst others, on the contrary, have decided, that of certain medicines less is to be given by the rectum than by the stomach. The preponderating opinion, however, seems to be, that, as a rule, between two and three times more may be given by the rectum than by the stomach. Medicines administered by the rectum are of two forms, solid and liquid, *suppositories* and *enemata*. *Suppositories* are usually of conical shape, from one to two inches in length, and never exceed the little finger in size at the base. They are lodged in the rectum, and are intended either to soothe or cause local irritation, to affect the system generally, to react upon neighbouring organs, or to act as purgatives. Cacao butter forms, perhaps, the most frequently employed vehicle for suppositories, though gelatine has lately come into pretty general use in their preparation; and soap, with starch, is the vehicle ordered in the preparation of these suppositories in the British Pharmacopœia. *Enema*, (*Clyster*, *Glyster*, *Lavement*)—This is either a simple fluid, as water, or one containing medicinal or nutrient ingredients, thrown into the rectum and colon. Enemata are generally intended to produce local effects; but sometimes, by causing irritation, or by being absorbed, they influence remote parts. Their object may be to remove irritating substances and accumulations from the rectum, to act as purgatives, or to soothe or irritate the rectum and organs in its vicinity, for a variety of purposes. The substance to be introduced is determined by the nature of the case; the quantity is determined by the object to be attained and the age of the patient. If the enema is to remain, it should be introduced as quietly as possible, should be small in quantity, and of medium temperature, because if bulky, cold, or violently injected, it will cause forcible contraction of the gut and its own expulsion. If the enema is to be retained, it should not exceed half-an-ounce for a child, nor three ounces for an adult. Otherwise, for a child under five years, three or four ounces; from ten to fifteen years, six to eight ounces; and for an adult, rarely exceeding sixteen ounces. An infant requires about one ounce. Care must be taken, in applying the instrument, not to injure the parts; the pipe should be previously oiled or greased, and when insoluble and irritating medicines are injected, they should be suspended in some bland mucilaginous vehicle. Gaseous substances have been injected into the rectum, but this practice is now seldom resorted to. The frequent employment of enemata often leads to deplorable results, and patients should be cautioned against their habitual use.

The mucous membrane of the mouth, throat, and nose is seldom used for the application of medicines, except for local purposes; but mercurial and auric preparations have been rubbed into the gums to produce constitutional effects. *Sternutatories* or *ptarmics* cause sneezing, and *errhines* produce discharges, when applied to the pituitary membrane. *Masticatories* are used as solid local applications to the cavity of the mouth, and *washes* or *collutoria* as fluid applications. *Gargles* are applied to the pharynx and tonsils. For arresting the hemorrhage in epistaxis, a variety of substances are injected; and, finally, *plugging the nostril* is resorted to in severe cases. *Condiments* are used chiefly to quicken the appetite. The *conjunctiva* is used only for local purposes. *Eye-washes*, *eye-water*, or *collyria*, are liquid applications, containing medicinal substances; they are either stimulants or sedatives, astringents or escharotics, according to the circumstances of the case. Applications to the conjunctiva should be made with extreme caution, for irreparable mischief may be done by their abuse. Lead collyria should be avoided where the conjunctiva is broken, otherwise a permanent opacity may result.

Medicines are occasionally applied to the *Eustachian membrane* for local purposes, but this practice should be followed with extreme caution; and medicinal applications even to the *meatus auditorius externus* are not to be made indiscriminately.

The membrane lining the air-passages is very susceptible, and medicines applied to it act powerfully, as they are exposed to an exceedingly large absorbing surface. Formerly, this membrane was much more frequently used for the administration of medicinal substances than it is at present. The practice of *inhalation* and *fumiga-*

*tion* is chiefly confined to local purposes, as for the relief of distressing symptoms in chronic bronchitis, asthma, phthisis, &c.; but it is also employed to induce general anæsthesia, and as a channel for the introduction of stimulants, such as the vapour of ammonia, aromatic vinegar, &c. Impalpable powders and powerful gases are rarely exhibited by this method now, though formerly much vaunted. Aqueous vapour, either alone or charged with some medicinal substance, is often inhaled with advantage in affections of the air-passages—a process which may be readily affected by holding the head over a basin of hot water, by cautiously inhaling it from the spout of a lightly-covered teapot, or by the use of one of the many instruments invented for the purpose. Fumes for inhalation are created in a variety of ways—as by saturating paper in a solution of the medicine, and, when dry, burning it in the sick chamber, or by throwing medicinal substances upon hot coals, and directing the fumes into the room. Medicated *cigars* and *cigarettes* are also used. Dr. Corrigan invented an instrument for the exhibition of medicated vapours, an account and representation of which is to be found in the "Dublin Medical Journal," vol. xv. The object of this, as it should be of all similar instruments, is to afford the following facilities for a fair trial of inhalation as a remedial process:—1. That the apparatus be simple in its construction, and easily kept in order; 2. That it be capable of keeping up a supply of vapour for any length of time, and that the evolution of the vapour be steady, and easily regulated; 3. That it furnish a sufficient supply of aqueous vapour, to prevent any irritation of the larynx or lining membrane of the tubes; 4. And most important of all, that its employment should entail neither trouble nor fatigue on the invalid.

A method of applying solid medicinal substances to the larynx is sometimes used under the term *insufflation*. The substance to be employed is first reduced to an impalpable powder, it is then placed in a tube, one end of which is carried to the back of the mouth, when, by means of a forcible inspiration, a part of its contents is drawn into the larynx. Fluid applications are sometimes introduced into the larynx by means of the *probang*, and sometimes they are inhaled in the form of spray, the fluids being reduced (*pulverised* or *atomised*, as it is called) by instruments invented for the purpose. The latter plan is frequently used for the inhalation of substances that cannot be readily volatilised.

2. *The Genito-urinary tract of Mucous Membrane.*—Medicines are applied to this membrane only for local purposes, and either in the solid or liquid form, as of medicated bougies, caustics, pessaries, and

injections. The urethra, bladder, vagina, and uterus are each occasionally treated locally by these means, but in the latter case *only with extreme caution. Injections* are *internal lotions* introduced by means of a syringe into certain canals or cavities of the body, whether natural or the result of disease. They consist of water or other fluid holding medicinal substances in solution or suspension. The contents of the injection will depend upon the object to be attained; they may be used as astringents or emollients, as irritants or sedatives.

*Skin.*—Medicines are not absorbed so rapidly by the skin as by mucous membranes. The rate of absorption depends, *cæteris paribus*, upon the delicacy of the tissue. The horny skin of the palms of working men, for example, would scarcely absorb at all, whilst between this and the denuded cutis the power of absorption is variously modified. The question of the capability of the skin to absorb medicinal substances from their solution in baths, though fully admitted by the ancients, has been discussed, from time to time, since the close of last century. At that time Abernethy and Falkner concluded, from experiments, that absorption did take place; and following them, on the affirmative side, were *Braconnot*, *Madden*, *Homolle*, *O. Henri*, *Chevallier* and *Petit*, *Heidler*, and others. Of an opposite opinion were *Seguin*, *Currie*, *Lehmann*, *Kletzinsky*, *Duriau*, *Thomson*, and others. Medicines are applied to the skin either for local or remote purposes; but in order to produce the latter, they must either be absorbed, or act by counter-irritation. As the cuticle impedes absorption, it is often removed to facilitate the process. The methods of applying medicines to the skin are three:—

1. *The Enepidermic Method.*—By this process, as the term implies, the medicine is simply placed upon the epidermis. Poultices, fomentations, lotions, baths, plasters, blisters, &c., are applied enepidermically.

2. *The Iatraleptic Method.*—This process requires more than mere apposition; the term signifies *to cure by anointing* (ἰατρεύω and ἀλείφω). It has also been called the *epidermic method*, *anatripsologia* (ἀνατρίβω, *to rub in*), and *espnoic medicine.* By this method the medicine is rubbed into the skin, as in the application of ointments and liniments. Other substances may be used as vehicles for the active medicinal ingredient, and some writers have recommended the *gastric juice*, *saliva*, and *bile* for this purpose.

3. *The Endermic or Emplastro-endermic Method.*—In this process the epidermis is removed, and the medicine is applied directly to the true skin. Absorption takes place much more rapidly under this than

under either of the previous methods. A blistering plaster, or a vesicating ointment or liniment, may be used to raise the cuticle, which may be either removed or simply opened to let out the serum and admit the medicine. Small quantities of the more active medicines are usually applied to the cutis thus exposed, such as strychnia, aconitia, tartar emetic, &c., but extracts, impalpable powders, &c., have also been used, which, however, must be readily soluble, or they cannot be absorbed. The objections to this method are chiefly the pain of the blistering, and, in exposed parts, the disfigurement caused by it ; but it is often of great advantage in cases in which the stomach, from causes already related, cannot be employed, or in the case of a purely local disorder.

Except when the epidermis is raised, and the medicine is directly applied to the *cutis vera*, the operation of medicines introduced by the skin is often tardy and uncertain. The dose of a medicine to be administered by the skin is generally larger than it would be by the stomach—sometimes two or three times more, sometimes six, eight, ten, or even more. There is no rule for regulating the doses thus given; but a safe plan, when we have not had experience of the effects by previous trial, is not to apply more than would be safe if the whole were taken into the system, especially if the medicine be applied *endermically*. Œsterlin suggested the following relative proportions as doses to be applied to the different parts of the body :—By the stomach, 1; by the unbroken skin, 3 to 6; by the endermic application, 1 to 3; by ulcers and suppurating sores, 2 to 4. Medicines have also been introduced into the system by *inoculation*, but the practice never became common.

*The Hypodermic Method.*—The injection of medicines into the cellular tissue, by means of a small graduated syringe, with trochar and canula, or with a finely-pointed tubular needle, is practised successfully for the topical application of remedies, as in certain cases of neuralgia. This method is exceedingly prompt, and the effects of the medicines so introduced are often, generally as well as topically, more powerful than when administered by the mouth. It requires, consequently, in the case of a very active medicine, such as atropine, that the dose be considerably less than if it were given by the mouth. Its value is now recognised in the Pharmacopœia, which supplies a formula for a hypodermic injection of morphia. But many other substances are used in this way. Care should also be taken to avoid the neighbourhood of a large vein or artery, in the one case, lest harm result from the medicinal substance being suddenly mixed with the circulating fluid; in the other, lest there be troublesome bleeding.

In some cases, injurious suppuration of the subcutaneous cellular tissue results even when the substances injected are not of an irritating nature.

*Serous Membranes.*—Medicines are applied in certain circumstances to serous membranes, but only for local purposes. The most common instance of this is the injection of irritating substances into the *Tunica vaginalis* for the radical cure of hydrocele. With a similar object, strong solutions have been injected into the peritoneal sac, for the cure of ascites; and into the sac of the pericardium, for the relief of pericarditis with effusion; but although this practice has in several instances been attended with success, it is fraught with danger.

*Wounds.*—Whether the result of accident or the gradual effect of disease, as ulcers and abscesses, these lesions have been made the seat of medicinal treatment. Commonly, the object of applying medicines to abraded or ulcerated surfaces is to effect their cure; but sometimes they have been taken advantage of to produce constitutional effects.

*Veins.*—Medicines act most rapidly when plunged at once into the circulation by means of an open vein. This process has been adopted at intervals for several centuries—now vaunted, now decried. It is unquestionably a dangerous practice, and ought to be resorted to only in last extremities. The dangers are chiefly three: the introduction of air into the vein during the operation proving immediately fatal; poisoning by administering, under the circumstances, too large a dose; and subsequent phlebitis. But this method has in several instances proved successful. It has been serviceable in cases of threatened asphyxia, arising from the impaction of a solid substance in the œsophagus, by which the ordinary method of exhibiting a remedy was prevented. Köhler injected six grains of tartar emetic into a vein of the arm of a soldier: vomiting ensued, by which a piece of beef tendon was ejected from his œsophagus, and the man was thus relieved from threatening asphyxia. In other cases of threatening asphyxia, in narcotic poisoning, in the collapse of cholera, in tetanus, hydrophobia, &c., the injection of water, saline solutions, and other remedies have been resorted to.

*Transfusion of Blood.*—The transfusion of blood by connecting the venous circulation of two individuals has been resorted to with comparative frequency; but, like many other practices attended with danger, it has been from time to time prohibited by general disapproval. After being long in disuse, it was restored by Dr. Blundel nearly half-a-century ago. Transfusion has been chiefly used in cases of exhaustion from hemorrhage occurring to women in the puerperal state; it has been resorted to also in hemorrhage from other causes—

in anæmia, in epilepsy, in cases in which nutrition is interfered with by organic disease, in debility from profuse discharges, &c.; but it is in hemorrhagic cases that it has proved most successful. The chief dangers attending the operation are the *admission of air into the veins*, and the *coagulation of the blood* in its passage from one vein to the other. Dr. Blundel's transfusion syringe is intended to obviate these risks.

Besides the methods already enumerated, by which medicines may be applied to the human frame, there are others also which we cannot dwell upon. There is, for example, a class of *psychical* or *mental remedial* agencies, which is of the utmost importance in the treatment of disease. The moral and intellectual affections of the mind demand the physician's attention; when violent, they may be subdued, when feebly exercised and when perverted, be restored to their proper functions. The mind may also be affected by external agencies applied to the senses: thus, the eye may contribute attractive scenery, the ear harmonious sounds, the nose and mouth the gratifications afforded by pleasant odours and tastes, and the sense of touch the soothing influence of gentle friction. Again, modifications of diet, exercise, sleep, clothing, and all that we comprehend under the term change of climate, form another class of what are known as *hygienic* remedies, which, although they are too extensive to admit of a place in the *Note-Book*, are nevertheless of the highest importance.

**5. Circumstances which modify the Actions of Medicines.**—These circumstances may be divided into two classes: A. Those which relate to the medicine. B. Those which relate to the patient.

A. *Circumstances on the part of the Medicine.*—We have already seen that climate, soil, cultivation, and the manner of collecting, preserving, and preparing them, exercise modifying influences upon medicinal substances, especially those obtained from the vegetable and animal kingdoms. Other circumstances, also pertaining to the medicines, affect their action.

1. *The Dose.*—The action of a medicine differs both in kind and degree, according to the quantity administered. In a certain dose a substance may act as a tonic, in a larger as a corrosive irritant; another substance may act as a sedative in a small dose, and as an emetic and indirect stimulant in a larger dose. In small doses medicines usually act slowly, and produce permanent effects when continued for a length of time; in larger doses they act promptly, and are commonly given for temporary purposes.

2. *The Physical Condition of the Medicine.*—The state of *aggregation* of a medicine modifies its effects, both in kind and degree. Medicines

act most promptly when minutely divided, as in *solution* and *vapour*. All substances to be absorbed must be either exhibited in a state of solution, or be capable of solution in the secretions of the parts to which they are applied. Many medicines which act promptly and energetically when given in solution, scarcely act at all when given in the solid form; hence the importance of choosing a suitable galenical preparation according to circumstances. The more finely a medicine is divided the less prominent will be its topical, and the more powerful its general, effects. The substances with which medicines are *mechanically* combined also modify their action. They may interpose an impediment to their contact with absorbent membranes, as when arsenic is mixed with finely-divided charcoal, or when medicines become mixed with food after a meal. Under such circumstances substances, which would otherwise have produced powerful effects, are sometimes removed from the alimentary canal, either by regurgitation or by purging, without having caused any serious results. When active principles alone are given, their action often differs from that which follows the administration of the entire substance from which they are obtained; thus quinine, although an elegant form of medicine, is not always an efficient representative of bark, nor morphia of opium.

3. *The Chemical Condition of the Medicine.*—Medicines which act energetically in one form of chemical combination may differ both in kind and degree, as to their action, in other chemical relations. Those which evince a powerful local or topical action are essentially modified by chemical combination, as may be observed in the case of an acid or an alkali; when given separately their action may be powerful, even hazardous, but when combined their effect may be scarcely perceptible. On the other hand, when medicines act by absorption into the circulation, their effects are not modified to the same extent by this circumstance; for there are many medicines—such as morphia, strychnia, arsenic, and others—which produce their characteristic results more or less energetically, in whatever chemical form they may be administered. In reference to this modifying effect with respect to poisons, Dr. Christison has laid down *two general laws*:—1. *That poisons which only act locally have their action much impaired or even neutralised in their chemical combinations.* 2. *That the action of poisons which operate by entering the blood, although it may be somewhat lessened, cannot be destroyed or altered in the chemical combinations.*

B. *Circumstances on the part of the Patient.* *a. Physical Causes.* *b. Mental Causes.*

*a. Physical Causes.*—*α. Original Conformation, Symmetrical Peculiarity, Constitution, Idiosyncrasy.*—As no two individuals are alike in these things, so no two are subject alike to the actions of medicines. Many illustrations might be given in support of this dogma did space allow. Experience alone can determine these peculiarities; we cannot predicate the effect of an untried medicine, except upon very general and vague principles. We cannot foretell, for example, except by experience, as from ancestral or personal history, that a dose of calomel that might be given with advantage to one person will produce salivation in another; that a dose of opium given to soothe will result in delirium, or perhaps produce no effect whatever. The general tendency of *Idiosyncrasy* is to increase the activity of medicines, and even to render injurious things commonly pleasant and innocuous, as in the instance of perfumes, which to some are agreeable, to others overpowering. Many articles of food, shell-fish as an example, which are partaken of freely by some, are poisonous to others. Idiosyncrasy sometimes, however, assumes an opposite character, of enabling the individual to take noxious substances with impunity. This is not to be confounded with *Habit.*

*β. Habit* tends to lessen the action of medicines. Some individuals can take as much opium, arsenic, corrosive sublimate, alcohol, &c., in one day as would poison several unaccustomed persons. The statements respecting arsenic eaters and corrosive-sublimate eaters have been accepted with hesitation, but of opium eaters we have unfortunately only too many examples, and of habitual drunkards still more. With respect to the influence of habits on the actions of poisons, Dr. Christison states:—*On the whole, it would appear that more change is effected by habit in the action of the organic than in that of the inorganic poisons; and that of the former, those which act on the brain and nervous system, and produce "narcotism," are altered in the most eminent degree. Bouchardat* has stated that habit will not exempt individuals from the effects of those substances which act as poisons to every member of the organic world; but that exemption may be purchased by habit from the effects of those substances which, although generally poisonous, spare certain classes of organised beings. The *general habits* of the patient, his profession, business, or occupation, his diet, and other circumstances connected with his daily pursuits, influence the actions of medicines; and there are certain indications of treatment in the cases of the rich and the poor, the spare and the plethoric, the man of active and the man of sedentary habits, which are far more easily learned from careful clinical observation than from volumes of literature. The habitual use of cathartics, and especially of that class of enemata, often leads to deplorable results, against which patients cannot be too urgently cautioned.

γ. *Age.*—Anatomical and physiological circumstances both modify the actions of medicines relative to age, and to a limited extent the influence of age is analogous to that of *stature;* for in children and little adults the medicine has a smaller range of surface to act upon. But this is almost unimportant when compared with the intense susceptibility of children, especially infants, as compared with adults; their nervous system is so readily excitable, that many substances in doses that would scarcely affect an adult, would excite a child perhaps to convulsions. Aged persons also are more susceptible of the action of certain medicines than adults. Depressing medicines, as evacuants, whether external or internal, are to be used very sparingly at extreme ages; children and old people bear them badly. Children do not bear opiates, but they are not affected constitutionally in the same manner as the adult by comparatively large doses of calomel. No fixed rule can be laid down to determine the doses at certain ages, because the effects of all medicines are not the same at any given age—take opium and calomel as examples. But there is an approximation to a general rule, and it assumes this character, that the dose increases in quantity from birth to the prime of life, reaching its maximum about fifty, and then gradually declines as age advances. The posological tables of Gaubius, Young, and Hufeland are as follows. Gaubius, fixing the dose for an adult as unity, gives the following proportions at different ages:—

| | | | |
|---|---|---|---|
| Under 1 year, | $\frac{1}{15}$ to $\frac{1}{12}$ | Seven years old, | $\frac{1}{3}$ |
| Two years old, . . | $\frac{1}{8}$ | Fourteen, " | $\frac{1}{2}$ |
| Three " . . | $\frac{1}{6}$ | Twenty " | $\frac{2}{3}$ |
| Four " . . | $\frac{1}{4}$ | Twenty to sixty, | 1 |

Dr. Young's rule is, that for children under twelve years the adult doses of most medicines must be diminished in the proportion of the age to the age increased by twelve; or, in other words, add twelve years to the age of the child, and divide the real age by the sum, thus:—

$$\begin{array}{l} \text{Child's age} \\ \text{Add 12} \end{array} \frac{1}{1+12}=\tfrac{1}{13} \qquad \frac{2}{2+12}=\tfrac{1}{7} \qquad \frac{3}{3+12}=\tfrac{1}{5} \qquad \frac{4}{4+12}=\tfrac{1}{4}$$

Hufeland gives the following proportionate doses for different ages, fixing the adult or maximum dose between the years twenty-five and fifty:—

| | | | |
|---|---|---|---|
| ½ to 1 month | ½ to 2 parts. | 5 to 7 months | 6 to 7 parts. |
| 1 ... 2 months | 2 ... 4 ... | 7 ... 9 ... | 7 ... 8 ... |
| 2 ... 3 ... | 4 ... 5 ... | 9 ... 11 ... | 8 ... 9 ... |
| 3 ... 4 ... | 5 ... 6 ... | 1 ... 2 years | 10 ... 13 ... |

| | | | |
|---|---|---|---|
| 2 to 3 years | 13 to 16 parts. | 20 to 25 years | 35 to 40 parts. |
| 3 ... 4 ... | 16 ... 18 ... | 25 ... 50 ... | 40 ... — ... |
| 4 ... 5 ... | 18 ... 20 ... | 50 ... 70 ... | 40 ... 30 ... |
| 5 ... 10 ... | 20 ... 25 ... | 70 ... 80 ... | 30 ... 25 ... |
| 10 ... 20 ... | 25 ... 35 ... | | |

δ. *Sex.*—In childhood there is little difference between the sexes as to the actions of medicines; but in adult life the difference of functional activity exercises a modifying influence. Menstruation, pregnancy, and lactation are circumstances in the female demanding anxious consideration in the administration of medicines. Females are generally more susceptible of medicinal action than males—a rule like the rest, however, which has many exceptions. During lactation, it is to be remembered that medicines given to the mother affect the child.

ε. *Disease.*—The nature and intensity of disease exercises a remarkable influence upon the action of medicines. We have examples of this in the inefficiency of enormous doses of opium in tetanus, and of mercurials in fever. Medicines requiring alkaline secretions to dissolve them will not act when the bile is retained, as in jaundice.

ζ. *Organs and Tissues.*—The action of a medicine is modified, both in kind and degree, according to the nature of the organ or tissue to which it is applied. This modification arises from two causes—the relative absorbent power, and the properties of the secretion of the part. The skin, mucous membranes, serous membranes, wounds, and open veins are the several channels by which medicines may be introduced into the system, and they are here enumerated according to their relative absorbent powers—from the skin, which is least active, to the open vein, which is the direct intrusion of the medicine into the circulation. The modifying influence of *organs* depends, in part, upon the properties of their tissues, but also on their relative sympathetic relations to other organs, and their importance to vitality.

η. *Climate.*—In estimating the value of climate as a modifying cause in the actions of medicines, it is to be remembered that the influence may be exercised upon the drug as well as upon the patient. A plant which yields active medicinal substances in one country, may be medicinally inert, though physically even more luxuriant, when grown in another, an influence which has already been adverted to. We have now to consider the effects of climate upon the patient—the medicine remaining the same. There is much in the *habits* of people of different nations, constituting *national character*, that is to be considered in the word *climate*, for we can scarcely dissociate the elements of daily existence, and allot to temperature, moisture, barometric pressure, and actinic force, such and such portions of the modifying influence. That climate, in this wide sense, does exercise a powerful influence upon the actions of medicines is scarcely to be doubted; but so complex is the question, and so intricately interwoven with the multifarious operations of the animal economy, that it is really very difficult to meet with unexceptionable proofs of its action. The following are among the instances quoted by Dr. Paris and other writers as indications of the effects of climate. The inhabitants of Rome are peculiarly affected by the odour of flowers, in some cases amounting even to syncope. Dr. Richard Harrison, in a communication to Dr. Paris, stated, as his experience, that narcotics act with greater force, even in smaller doses, at Naples than in England. Extract of Hyoscyamus, given in three-grain doses thrice a-day, produced temporary amaurosis in ten patients; and this effect was reproduced by a second exhibition of the medicine, although the same patients had been in the habit of taking the medicine in England without any unpleasant result. The same writer states that he had successfully treated several cases of epilepsy in Italy with nitrate of silver, while in England he had not met with the same good results. Mercurials are also more active in Italy than in this country. But mercurials are sometimes given in much larger doses in warmer climates than in our own country: in India, the West Indies, and many other countries, this class of remedies is sometimes administered in what we should consider enormous doses; not, however, for the purpose of producing constitutional effects, for which, indeed, they are but sparingly used. In his "Diseases of Bengal," Dr. Twining states that depletion by blood-letting, purgatives, mercurials, jalap, castor oil, &c., are used more sparingly with the natives than with the resident Europeans. Lascar sailors, it is said, require much smaller doses than Europeans. Persons who have recently changed their residence from one climate to another do not bear the doses usually given at their new residence at once, though the system soon accommodates itself to its altered circumstances. Albers states that Englishmen residing in Bonn are compelled to reduce the doses of medicines which they were accustomed to at home. Dr. Lombard, of Geneva, makes the same remark in regard to Englishmen residing in Switzerland. The state of the weather, the season of the year, and the time of day are also supposed to exercise an influence upon the action of medicines. Dr. Annesley states that the subsidiary fever of Nagpore is cured by cinchona bark in the cold season, but that this remedy fails in the rainy season, when it is replaced by calomel and antimony. The prevalence of epidemics is also a modifying cause.

*b. Mental Causes.*—The intimate relation of the mind and body is such, that physical suffering can scarcely be associated with a calm and passionless mind. In every case of sickness one or other of the mental emotions is aroused, and this the physician has to cherish or subdue according to the necessities of his patient. *Depressing* emotions are seldom favourable to recovery, and when they are predominant, it is our duty to awaken the patient to a feeling of hope, faith, and gladness, in order that the remedies applied may be seconded by that measure of *willingness to recover* without which even the most potent medicines will prove ineffectual. There is, above all, one feeling with which it is absolutely essential that the physician should inspire his patient, that of *faith,* not only in the efficacy of the means employed but in his own integrity, uprightness, and Christian conduct, an emotion which no personal advantages, however great, should induce him to forego. Diseases complicated with derangement of the intellectual faculties, and with nervous affections such as hysteria, especially demand attention to what may be termed *physical* therapeutics. Perhaps the most trying cases that a physician has to deal with are those suffering from long-protracted, ultimately hopeless, sometimes very painful diseases, which, whilst they demand his anxious care, afford little or no opportunity of displaying his skill. Perhaps he may feel humiliated, and would rather be without such patients. But no, he has one all-important duty yet to fulfil: his patient is daily craving for some new interference, for something that might surely still be done; but when, after due consultation, it is finally determined that further active interference would be unwise, then it is his duty to protect his patient from unprincipled quacks, who endeavour by their disgusting advertisements to attract the attention of such helpless patients or their friends, that they may increase by them their dishonest gains. Then it is that, by a careful balancing of the passions, inspiring no vain hope, whilst he dispels too anxious fears, the Christian physician may soothe the last days of his patient, pointing to that Great Physician in whose presence there is everlasting joy. Then, too, may the patient say—

"Let Fear, that watchful guard within,
Defend my soul from mental sin;
Let Hope her radiant charms display,
Dispel all doubts, and speed my way.
Let hate her keenest shafts employ,
Pride, Lust, and Envy to destroy;
Let no vile thought pollute my frame,
But love divine my soul inflame.
Thus every passion kindly given,
Shall smooth the path that leads to Heaven."

**6. The Prescription.**—We have already said that the physician's prescription occupies the very centre of the medical sciences, that it is the practical application of these sciences to the cure of disease. But in this wide sense the word is to be understood as synonymous with the terms *general instruction or direction.* A physician may cure certain patients without the aid of pharmacological remedies, by instructing them in, or directing them to pursue, a certain course of *hygienic* treatment. That, however, is not the sense in which we now use the word: we are to consider it as a *formula* chiefly intended to guide the druggist in the preparation of suitable pharmacological remedies. Prescriptions written by the physician to suit occasions are called *magistral*, because written by a master of his profession, or *extemporaneous*, because written without previous preparation—*ex tempore*.

To prescribe well is no easy matter. Independently of scientific and practical therapeutical knowledge, it demands an acquaintance with the practical details of pharmacy, which, in its turn, involves the laws of natural history, chemistry, and physics. The opportunity of studying practical pharmacy in a private laboratory, in the shop of a pharmaceutical chemist, or at a public hospital or dispensary, should never be neglected by the student of medicine. The knowledge thus acquired will prove to be of the utmost value in after-life; and it must be deeply regretted that so little has been done in this country for the encouragement of *Schools of Pharmacy*.

To write a prescription may appear to be a comparatively trivial matter, and often enough it is not until the student has become the practitioner that he is undeceived. Then he finds that there is a great difference between merely repeating a prescription from memory and devising and constructing one to suit a special emergency. Prescriptions are written either partly or wholly in *Latin* or in the *vernacular* language, the latter being used in France, the former more or less in Great Britain. Formerly the three Pharmacopœias of this country were written in Latin, but the later editions of the Edinburgh and Dublin Pharmacopœias, and the British Pharmacopœia, are in English. The *Latin* and *vernacular* have both been advocated, and it is still a matter of dispute as to which is the most appropriate. It appears to be generally admitted, however, that the names of the ingredients should be written in Latin, chiefly for the following reasons. *First*, Because the Latin name of a drug is more definite, usually the same in different countries, and is not rendered unintelligible by moderate contraction; *second*, Because the prescription can then be prepared by dispensers in foreign countries, as well as by those at home; and *third*, Because it is sometimes necessary to keep the patient in ignorance of what he is taking—a matter of much greater difficulty, however, since the introduction of scientific nomenclature into popular language. The reasons urged against the use of any but the vernacular language are chiefly the fear of mistakes occurring, either in consequence of the doubtful Latin of the prescription, or the ignorance of the dispenser, and that *Medical Latin*, being unlike the classical Latin, is not always intelligible, even to persons of liberal education. The common practice in prescribing, however, is to write in Latin that part of the prescription which is only for the instruction of the dispenser, and to employ the vernacular in the parts common to the dispenser and the patient.

The prescription is generally arranged in the following order:—

1. *The Heading of the Prescription* (*the præpositio, or superscription*).—This is used merely to arrest the attention of the dispenser; but it materially affects the grammatical construction of the prescription. It consists simply of the letter ℞. The origin of the practice of thus beginning a prescription is to be found in the ancient and popular belief in the sideral influences, the letter being, in truth, but a modification of the astrological symbol of the planet Jupiter. In early times prescriptions invariably began by a pious or superstitious reference to some controlling power. The expressions J. D. (*juvante Deo*), N. D. (*Nomine Dei*), J. J. (*juvante Jesu*), and the characters + and *α ω*, the sign of the cross, and the *alpha* and *omega* of the Greek alphabet, with reference to the Saviour, were in common use, and were termed the *invocation* or *inscription*. The letter is now, however, understood to be the initial of the word *recipe, take*, synonymous with the French prescription P. *prenez*. When this superscription is used, the Latin names of the ingredients following it are put in the *genitive* case and the quantities of each in the *accusative*. Thus, ℞ *Liquoris Ammoniæ Acetatis, drachmas duas*, signifies, Take two drachms of the solution of Acetate of Ammonia. When the prescription is written in English the superscription is "Take of,"—the sign of the genitive case, which is applicable to all the ingredients, being put in the superscription once for all.

2. *The Ingredients that are to be introduced into the Medicine* (*Materiæ designatio, the Inscription*).—The name of each ingredient, usually written in *Latin*, occupies a single line. The ingredients are arranged in one of two ways—either according to their therapeutical value, or according to the order in which the dispenser will find it most convenient to use them. The latter method is not essential, however, because it is the duty of the dispenser to carry out the inten-

tion of the physician by the most appropriate pharmaceutical method; but it is an evidence of superior attainments when the physician can attend both to the therapeutics and the accurate pharmaceutical details of his prescription.

In the selection of the pharmacological remedies to be employed, the physician is guided by the peculiarities of his patient, and the character of the disease to be treated. The circumstances which modify the actions of medicines are to be taken into consideration in conjunction with the history and present stage of the malady, and the general and special conditions of the patient. Having ascertained these points, the *Materia Medica* is divisible into two parts, the one containing substances that may be used, the other those which obviously cannot be used in the treatment—or, in other words, into medicines that are *indicated*, and those that are *contra-indicated*.

Treatment will vary according to such circumstances as the nature of the disease, the constitution of the patient, and the judgment of the practitioner; but there are a few cardinal rules that never alter, one or two of which I will mention. Never employ powerful medicines when others of a milder kind will answer the purpose: the more of a man's estate that remains after a lawsuit, the greater is the credit due to his legal adviser, and the more constitutional strength the patient has at the close of his illness the more grateful will he be to his physician. Never select a medicine, or administer one in such a manner that, although the disease may disappear during its exhibition, it may be said of its ultimate and permanent effects, that they are as bad as, or worse than the disease itself. When a plan of treatment has been resolved upon, do not impatiently break through it by frequently changing the medicine, in a vain attempt to combat every symptom; and do not cherish the idea that every improvement in the patient's condition is necessarily due to the medicine, and that every change for the worse is attributable to the disease; this is often a very difficult question to determine, and one which requires the nicest discrimination. Always bear in mind the state in which the patient will probably be in the next, or any subsequent stage of the disease, and endeavour as much as possible to protect him from treatment that would then militate against him. Always divide the responsibility, by consultation with an experienced brother, before pursuing a course of treatment by which the life of the patient may be placed in jeopardy. Next to his health, be careful of the patient's pocket; never hesitate to recommend that which is *essential*, however costly, but do not thoughtlessly spend his money upon expensive medicines or mechanical appliances of questionable utility.

The tendency of the practice of the present day is decidedly towards *simplicity* rather than *complexity* in prescriptions. We seldom now meet with the curious mixtures that were formerly so common, in which it would seem that the practitioners had united as many ingredients as possible, in the blind hope that one or other of them might hit the mark and cure the disease. But whilst *polypharmacy* is doubtless an evil when uncontrolled by science and reason, we may possibly, by refining too much, fall into an opposite error. Organic chemistry has conferred a great boon upon the physician by discovering and separating many of the powerful constituents of medicinal plants; but experience has shown that these elegant preparations are not always efficient substitutes for the plants themselves. Nor are simple prescriptions always preferable to those which contain two or more ingredients; for, by a judicious combination of medicines, results may be obtained which cannot be derived from individual remedies. What the physician has chiefly to guard against in the construction of a compound prescription, is the admission of substances, the object of whose presence he cannot explain. If there be four ingredients in a prescription, and the prescriber can only explain his intentions with respect to three of them, the fourth should be omitted, as it can only be there on chance. If we were restricted to the use of those drugs alone whose *modus operandi* can be clearly explained, we should at once be cut off from many of the most valuable remedies of the *Materia Medica*, the use of which rests upon no higher authority than the sanction of experience, and many of the valuable compound officinal formulæ by the same terms would be swept away. But it is not essential to the construction of a compound prescription that the practitioner be able to foretell infallibly the results to be produced by it, nor even that he be able to explain the *modus operandi* of all or any of the ingredients; it is sufficient if he can account for the presence of each constituent of the prescription upon some philosophical principle, or plan of treatment. If there be anything present that cannot be thus explained, the prescription would be better without it.

The object of the physician when prescribing should be—in the words of Asclepiades—*curare cito, tuto et jucunde*, and with this in view, the compound prescription is often, though by no means invariably or essentially, divided into four parts, namely—1. *The Basis* (the active *curative* principle—*curare*); 2. *The Adjuvant* (*Adjuvans*, an auxiliary, to make the basis act energetically and *quickly—cito*); 3. *The Corrective* (*Corrigens*, to cause the active ingredients to operate *safely—tuto*); and 4. *The Vehicle*, or *Excipient* (*Vehiculum*, *Excipiens*, *Constituens*, to give a suitable form, and to render the medicine *pleasant—jucunde*).

The prescriber who can judiciously combine two or more medicines has always more resources at command than one who knows only how to administer single remedies, or is confined to the compound officinal formulæ, or who, in his attempts at extemporaneous combination, fails to produce a useful or suitable medicine. The points to be held in remembrance in prescribing are chiefly those in relation to the therapeutical action of the remedies, their chemical behaviour both before and after admission into the system, and their physical condition.

*Therapeutically*, medicines may be rendered more active, either by combining two or more forms of the same substances ; by adding to the basis of the prescription an adjuvant derived from the same substance, but having a similar action, which is intensified by the combination; or by uniting a basis and an adjuvant derived from substances which, when given separately, do not produce a corresponding effect. The therapeutical effects of medicines may be obtained in some cases more fully by the addition of substances by which the untoward effects of the active ingredients are corrected, and without which the latter ingredients would either not be tolerated by the system, or would produce other effects. The ultimate and desired therapeutical effect of a prescription may also be attained by the combination of remedies which, though capable of producing identical effects when administered separately, attain their object by a different mode of action. And sometimes medicines are united which have separate and distinct indications to fulfil. All these forms of combination may be employed without necessarily inducing any obvious chemical changes.

*Chemically*, the object of the prescriber is to combine ingredients which either do not alter their original conditions when united in the same compound, or which act upon each other in such a way as to cause the disappearance of the original substances and the formation of a new and suitable compound. When two or more substances can be united without changing their chemical properties, they are said to be *compatible;* but when their combination gives rise to chemical changes, the substances are said to be *incompatible*. But these terms are to be understood as having merely a chemical significance, and not as precluding such combinations for therapeutical purposes. There are many instances amongst the officinal formulæ of compounds which do not represent the properties of their constituents. It is only when the prescriber unites substances capable of reacting chemically upon each other in such a manner as to cause changes of which he is ignorant, that he runs a risk of producing a compound which may be either dangerous or simply inefficacious as a medicine, according to circumstances. When chemical decomposition takes place amongst the ingredients of a prescription, the result may be one of four things:—*First*, That the prescription is dangerous, and unfit for use in the quantities prescribed. *Second*, That it is rendered medicinally inert. *Third*, That a new compound may have arisen with properties similar but more powerful, similar but less powerful, or altogether different from those of the original ingredients; and *Fourth*, That a new compound may be produced which, though not presenting the desired properties before administration, may be so modified by the secretions of the alimentary canal, as to become a convenient and suitable remedy.

*Physically*, the object of the prescriber is to produce a medicine suited both to the necessities and feelings of the patient. A medicine which, by its appearance, odour, or taste, is more than usually disagreeable, will probably frustrate the object of the prescriber, by creating an aversion and dread of it in the mind of the patient. The ingredients of a prescription may be *pharmaceutically*, as well as *chemically incompatible*; thus, when spirit of nitrous ether and tincture of guaiacum are combined, the result is a gelatinous mass unfit for use. Many of the resinous substances are precipitated from their spirituous solutions on the addition of water, and, therefore, when the ingredients are brought together, a mucilaginous substance is required to form a suitable mixture. This matter has already been adverted to in the section devoted to officinal formulæ.

The quantities of the several ingredients of the prescription are to be represented by certain characters, which have already been described with the weights and measures used in pharmacy. The quantity is placed at the end of each line opposite to the ingredient to which it refers, except in prescriptions where two or more consecutive ingredients are ordered in equal proportions, when the quantity is written only opposite to the last of them, being preceded by the united letters *āā* (ἀνὰ) signifying "of each" *so much*.

When medicines are prescribed in forms in which the doses are divided into separate parts, as pills, powders, draughts, &c., the prescriber may either write the quantities sufficient for one dose, directing the dispenser to send two, four, six, a dozen or more of such; or he may combine the quantities, and direct the dispenser to divide the whole into *so many* pills, powders, &c. Perhaps the former plan is more conducive to careful prescribing, but the latter will, in either case, be adopted by the dispenser.

The *doses* of the ingredients will vary according to circumstances, some of which have already been referred to under the head of *modifying causes*. The prescriber will also consider the following points:

—Medicines that are to act promptly, and to fulfil a temporary indication, are usually given in full doses, whilst those which are given to produce constitutional and permanent effects are given in small and generally in gradually increasing doses. Some medicines diminish in activity in proportion to the duration of their exhibition, whilst others increase in activity the longer they are given. In the former case the dose is to be gradually increased, and in the latter gradually diminished. Some medicines are said to *accumulate* in the system; their action is sometimes suddenly manifested in an alarming manner, and does not subside, but, on the contrary, often increases, for some time after the patient has ceased to take them. Medicines with this tendency require extreme caution and watchfulness during their exhibition. Great care is to be observed also in the administration of powerful medicines when the prescription is prepared from a fresh stock of the active ingredient. When a druggist begins a new stock of a powerful remedy, apt to spoil by keeping, he should caution the physician, whose patient has been taking the medicine in increasing doses from the old stock, the probability being, that the new will be much stronger than the old. In such cases it is safer to reduce the dose so as to meet the probable difference. The physiological and therapeutical actions of medicines differ according to the doses in which they are given; thus tartar emetic in small doses acts as a diaphoretic and expectorant, but in larger doses as an emetic. But if it be given in gradually increasing doses, it does not produce emesis, but acts in the larger doses as a contra-stimulant. This method of exhibiting such medicines is sometimes spoken of as *establishing a tolerance.* The interval between the doses varies according to the objects to be attained. When medicines are given for a length of time, with the view of producing gradual and permanent effects, it is important to observe the stated periods of their administration; for it is desirable to maintain a regular chain of effects, which cannot be accomplished if the links are sometimes longer, sometimes shorter, and sometimes omitted altogether. There is one more point of importance, one which is often neglected; it is this, that when a medicine has been administered for a considerable time in gradually increasing doses, it should not, unless unusual circumstances arise, be suddenly stopped, but be gradually diminished in the inverse order of its early administration.

3. *The Directions to the Dispenser* (*Subscriptio, the Subscription*).—These also are generally written in *Latin;* they instruct the dispenser in the manner of preparing the medicine, and as to the form to be given to it. The shortest direction, and a very common one, is the

letter M., the initial of the word *Misce*, signifying *Mix* (*the ingredients*). S., the initial of *Solve* (*dissolve* the solid ingredients in the vehicle), is also frequently used. Then commonly follows Ft., the initial and terminal letters of *fiat* or *fiant, let be made:* thus—(*Ex His*) *Fiat Haustus* (of these ingredients), *let a draught be made; Fiat Mistura, let a mixture be made; Fiant pilulæ viginti, let twenty pills be made.* Or the instructions may be more minute, as in the following instance: —*Tere oleum cum mucilagine donec probé coiverint, tum sensim adde decoctum, ut fiat enema; Rub the oil with the mucilage until they are well combined, then gradually add the decoction, that an enema may be made.*

4. *Instructions to the Patient* (*Signatura, the Signature*). — This part of the prescription is sometimes introduced by the initial letter S., or by the word in full, *Signa* or *Signetur, call it,* or *let it be entitled* (the mixture, the draught, &c.) Then follow the directions that are to be written by the dispenser, for the patient's information, upon the label of the bottle or box. Some physicians still write the signature in Latin, but it would be much better if all would write it in English, for such a rule would greatly diminish the risk of errors. The signature should contain full and plain directions as to the quantity to be taken at a time, the intervals between the doses, and the mode in which the medicine may be most agreeably or conveniently administered. All powerful remedies to be applied externally should be distinctly labelled Poison, or For External Use Only. The new Pharmaceutical Act renders it now imperative upon the dispenser to label all dangerous medicines Poison, whether the physician order it so or not. Patients are seldom provided with graduated measures wherewith to apportion their doses; they commonly use articles employed for domestic purposes. It is necessary, therefore, that the prescriber should be familiar with the relative capacities of pharmaceutical and domestic measures.

| | | | | | |
|---|---|---|---|---|---|
| A tea-spoonful | is generally | equal to | 1 | fluid | drachm. |
| A dessert-spoonful | „ | „ | 2 | „ | „ |
| A table-spoonful | „ | „ | 4 | „ | „ |
| A wine-glassful | „ | „ | 1½ to 2 | fluid | ounces. |
| A tea-cupful | „ | „ | 5 | „ | „ |
| A breakfast-cupful | „ | „ | 8 | „ | „ |
| A tumblerful | „ | „ | 10 to 12 | „ | „ |

Sometimes the physician gives verbal directions to the patient himself, and for the signature writes only, "To be taken as directed;" but this is not a good or safe rule to adopt, as serious mistakes may result from it. There are, however, cases in which this form of signature is desirable—namely, those in which full directions for the taking of the medicine would betray the nature of the patient's complaint. Most people are extremely sensitive on this point, and it would be as injudicious for the physician to advertise his patient's malady on the label of the medicine bottle as it would be opposed to medical ethics to repeat what he had seen or heard in a patient's house. The physician cannot be too careful to avoid wounding the feelings of his patient.

5. *Name, Date, and Initials.*—The name of the patient is written legibly, and in English, at the foot of the prescription; beneath it is the date, which is sometimes written in Latin, but with no peculiar advantage. Lastly, the physician's initials complete the prescription. The initials should be distinctly written; indeed, it is a question whether it would not be better to write the name in full, so that the dispenser might the more readily recognise the author, and so be able to communicate with him immediately, in case of need. In large cities it must be difficult to recognise the initials of all the physicians; and it is to be remembered that the physician's signature is the only justification for the sale of certain poisonous drugs.

The different parts of the prescription are noted in the following examples;—

| | | |
|---|---|---|
| 1 ℞: | Elaterii, granum dimidium . . . | (*Basis*). |
| 2 | Hydrargyri Subchloridi . . . . | (*Adjuvans*). |
| | Pulveris Capsici, ana, grana duo . . | (*Corrigens*). |
| | Confectionis Rosæ caninæ, quantum sufficiat | (*Excipiens*). |
| 3 | Fiat Pilula. Signetur. | |
| 4 | The pill; to be taken to-morrow morning. | |

Patient's name.
Date.

Initials.

The following is the *house medicine* or *black draught* of most hospitals:—

| | | |
|---|---|---|
| 1 ℞: | Magnesiæ Sulphatis, unciam . . . | (*Basis*). |
| 2 | Tincturæ Sennæ<br>Tincturæ Jalapæ . . . . | (*Adjuvantia*). |
| | Syrupi Zingiberis, ana fluiddrachmas tres | (*Corrigens*). |
| | Infusi Sennæ uncias quinque . . . | (*Vehiculum*). |
| 3 | Misce, fiat Mistura Aperiens. Signetur. | |
| 4 | The Aperient Mixture; to be administered in doses of three or four table-spoonfuls. | |

1. Heading, Præpositio, or Superscription. 2. Ingredients, Materiæ

designatio, or Inscription. 3. Directions to the Dispenser, Subscriptio, Subscription. 4. Instructions to the patient, Signatura, Signature.

The same prescriptions abbreviated :—

℞
Elaterii, gr. ss.
Hydrarg. Subchlorid.
Pulv. Capsici, āā gr. 2.
Confec. Rosæ can. q. s.
Ft. pil. i. Sig. &c.

℞ Mag. Sulph. ℥i.
Tinct. Sennæ.
Tinct. Jalapæ.
Syr. Zingib. āā f ʒiij.
Inf. Sennæ, f ℥v.
M. ft. Mist. Aperiens. Sig. &c.

I have here used the old symbols of the ounce, the fluid ounce, and the fluid drachm, but the student will remember that in the British Pharmacopœia these are replaced by the abbreviations *oz.*, *fl. oz.*, and *fl. dr.*

In writing the prescription, the student will bear in mind the following points :—1. To write distinctly; 2. Not to abbreviate the words so as to make them unintelligible to the dispenser, or in any way to cause errors; 3. To be very particular in writing the characters represeesenting the quantities of the ingredients ; 4. Carefully to revise the prescription on every occasion before parting with it.

# PART II.—INORGANIC MATERIA MEDICA.

## CLASS I.—METALLOIDS OR NON-METALLIC BODIES.

### GROUP I. GASEOUS—OXYGEN [OZONE], HYDROGEN [WATER], NITROGEN, CHLORINE.

### OXYGEN (O=16).

*Preparation.—Most commonly* by heating together four parts of finely-powdered chlorate of potash, and one part of well-dried peroxide of manganese ($KClO_3=KCl+O_3$); the peroxide of manganese is used in this process merely because it causes the expulsion of the gas at a much lower temperature than would be required if the chlorate were heated alone.

*Characters.*—An elementary, permanent, colourless, inodorous, tasteless gas; the chief supporter of combustion and respiration; Sp. gr. 1·1057.

OXYGEN WATER.—Aqua oxygenata seu oxygenii is simply water charged with oxygen by means of a suitable apparatus, the proportion of oxygen contained in the water being generally as one volume of the gas to two of the water. This preparation is not to be confounded with *peroxide of hydrogen*, which was formerly called *oxygenated* or *oxy-water.*

OZONE—When first discovered, was supposed to be a new elementary substance, but was subsequently ascertained to be merely a form of oxygen. It received its name from its discoverer, Schönbein, who called it ozone, in consequence of its peculiar odour (*ὄζω, I smell*). It is a powerful oxidising agent, is denser than oxygen in the proportion of 3 to 2, is produced when the electric spark is passed through dry air, is contained in electrolytic oxygen, and is formed during the slow oxygenation of various substances in air, as, for instance, of phosphorus, ether, alcohol, or, more particularly, of certain volatile oils, for example, oil of turpentine.

*Therapeutics.*—Oxygen is essential to the support of vigorous animal and vegetable life; but it cannot be respired in the pure state without causing injurious effects, and ultimately death. In moderate quantity, sufficiently diluted, it gives rise to exhilaration of spirits, accelerates the circulation, and causes slight diaphoresis, effects which are, however, exceedingly transient. Locally it is a stimulant.

Formerly, oxygen enjoyed a therapeutical reputation, but it is now seldom administered. The cases in which it has been most frequently used are those in which pure unvitiated air is obviously indicated, as in asphyxia, whether produced by deprivation of air, or by the inhalation of poisonous vapours; and in chronic pulmonary diseases in which dyspnœa is associated with general debility. It has also been administered, both internally and topically, in unhealthy wounds, ulcers, gangrene, &c.

Oxygen water has been given in quantities of one or two bottlefuls daily, as a mild stimulant to the secreting organs. It has been recommended chiefly in cachæmic diseases, with the view of promoting the powers of assimilation and secretion.

The value of *ozone* as a curative and hygienic agent cannot be duly estimated until its properties are more fully recognised; but that it is intimately associated with the health of communities is generally believed. It is, probably, in consequence of its oxodising property, a disinfectant. There is abundance of negative evidence of the utility of ozone, such as, that it exists in largest quantity in pure air, more abundantly in the higher than in the lower strata of the atmosphere, much more without than within large cities, and more to windward than to leeward of them. It exists more abundantly in some than in other winds, and when air becomes stagnant it vanishes. Cholera and ozone are said to avoid each other. Ozone has been supposed also to be capable of destroying malaria. Schönbein observed that the quantity of ozone in the atmosphere and the prevalence of malarial diseases bore an inverse relation to one another, and this he found to be the case, not only in point of time, but also in respect of locality, results which have been confirmed by other competent observers.

## HYDROGEN ($H=1$).

*Preparation.*—The readiest method is by the action of zinc upon sulphuric acid in water ($H_2SO_4+Zn=ZnSO_4+H_2$).

*Characters.*—It is a permanent, neutral, invisible, tasteless, and, when pure, an inodorous gas, but it usually has a peculiar odour, due to the presence of foreign substances. It is the lightest form of matter known, its sp. gr. being 0·0693. It burns in contact with air with a pale-yellowish flame, but does not support combustion, and when mixed with air and ignited it explodes violently. It is very sparingly soluble in water.

HYDROGENII PEROXYDUM (or $H_2O_2$).—Peroxide of Hydrogen was discovered by Thénard in 1818, and is generally prepared according to his process, by the action of hydrochloric acid upon peroxide of barium ($BaO_2+2HCl=BaCl_2+H_2O_2$). It was formerly called *oxygenated water*, or *oxy-water*, from the supposition that it consisted merely of water holding an additional equivalent of oxygen; but it has been obtained free from water, and is found to be a definite compound of oxygen and hydrogen. It is a colourless liquid of syrupy consistence, having a sp. gr. of 1·452. It is soluble in water, is a powerful oxidiser, and bleaches the skin and mucous membrane when applied to them undiluted.

*Therapeutics.*—Hydrogen is not used medicinally in the present day, but was formerly tried in phthisis, rheumatism, paralysis, &c., without attaining a permanent reputation. The respiration of *percarbonated-hydrogen gas* was also formerly recommended in affections of the lungs.

*Peroxide of Hydrogen*, when properly diluted, acts as a stimulant. When applied to the skin or tongue it causes a prickling sensation; it thickens the saliva; and when administered freely, has caused profuse salivation. It has of late been strongly recommended in diabetes mellitus. It is employed in heart-disease, attended with pulmonary congestion, in hooping-cough, chronic bronchitis, phthisis, struma, mesenteric disease, rheumatism, jaundice, dyspepsia, &c. Dose, fl. dr. ss. to fl. oz. ss., well diluted in water.

AQUA.—Water—Natural Water ($H_2O$) is placed amongst the *Materia Medica* of the pharmacopœia. It is required to be the purest that can be obtained, cleared, if necessary, by filtration, and free from odour, taste, and visible impurity. The chief varieties of fresh-water are rain-water, spring-water, lake-water, river-water, and marsh-water; but as all these varieties contain more or less of impurities, they are unfit for pharmaceutical purposes, for which there is an officinal distilled water. The subject of the purity and properties of common water belongs rather to hygiene than to pharmacology.

## Aqua Destillata—Distilled Water.

PREPARATION.—*Take of water, free from taste and odour, ten gallons. Distil from a copper still, connected with a block-tin worm, reject the first half gallon, and preserve the next eight gallons.*

*Therapeutics.*—Natural, plain, or common water is largely used as an article of diet, both alone and as a constituent of solid food and of beverages. Medicinally, it serves, when taken internally, as a diluent, solvent, and occasionally as an evacuant; externally, it acts, according to the temperature at which it is applied, as a detergent, a tonic, a sedative, an emollient, a counter-irritant, &c.; and in the form of *water-dressing* it is of great value as an application to inflamed surfaces, wounds, and ulcers. Water is also largely used for baths, which may be either simple or medicated, local or general. When water alone is used, the effects of the bath will be determined by its temperature and duration. Baths are cold when the temperature of the water is below 60°; cool from 60° to 75°; temperate from 75° to 85°; tepid from 85° to 92°; warm from 92° to 98°; and hot from 98° to 112°. The temperature of the vapour-bath ranges from 112° to 144° Fahrenheit. Distilled water is largely used in most of the pharmaceutical processes requiring water as a menstruum, especially in the preparation of infusions, decoctions, and medicated waters.

AQUÆ MINERALES.—Every variety of natural water contains more or less of foreign substances in solution or suspension, to which it owes its peculiar taste, odour, or appearance, so that every spring that yields a good potable water might with propriety be called a mineral spring. The term *Mineral Water,* however, is usually confined to such as have more carbonic acid or sulphuretted hydrogen, or a greater proportion of salts, or a temperature above the mean heat of their latitude, or the term may be applied to those springs which possess properties in relation to the human body differing from those of ordinary water used as drink, and in this sense comprehend some remarkable for nothing but their purity.

Mineral waters derive their ingredients from the rocks and soil through which they pass in their way to the surface of the earth. They contain, besides, a variety of saline principles, a certain quantity of organic and inorganic substances, together with more or less of a free gas, either sulphuretted hydrogen, carbonic acid, nitrogen, or oxygen. They usually contain in greater or less quantity some or all of the following salts:—The hydrochlorates, sulphates, and carbonates of soda, lime, magnesia, potash, alumina, baryta, strontia, lithia, and manganese. Besides these, there are occasionally found bromine and iodine, and a variety of metallic salts, such as those of iron, copper, arsenic, &c. Some springs contain what has been imperfectly described as a *vegeto-animal* substance, known by the names of *baregine*, *glairine*, or *zoogine*, and another substance called *sulfuraire*. The former of these is amorphous, of gelatinous consistence, and of varying colour, density, and quantity; its constitution and use are but imperfectly understood, but it is supposed to give rise to the *chicken-broth* odour peculiar to certain springs. The latter is an organic substance, and belongs probably to a species of confervæ. But these vegeto-animal substances are of no importance from a therapeutical point of view; neither, in fact, are some of the other ingredients, which are present in far too small a quantity to exert any influence on the system, the really active principles of mineral waters being comparatively few, as $CO_2$ and $H_2S$, free or combined, chloride of sodium, sulphates, and carbonates of soda, iron, lime, and magnesia. But their activity is also in part due to the action of the water, used internally and externally, its temperature, bath appliances and the adjuncts, as change of climate, diet, rest, removal from care, exercise, hope, &c. We shall here consider them briefly under six principal classes, namely—1. Gaseous, acidulous, or carbonated; 2. Sulphurous, or hepatic; 3. Alkaline; 4. Chalybeate; 5. Bromo-iodurетted; and 6. Saline.

1. *Gaseous, Acidulous, or Carbonated Waters* are those which, in addition to their mineral ingredients, are more or less charged with carbonic-acid gas. They are generally limpid, colourless, and sparkling, and have a sharp sourish taste, and a feeble and evanescent acid reaction. These waters seldom owe their therapeutic value to their gaseous constituent alone, for it is usually associated with a variety of saline ingredients, some of which are held in solution by the gas, and are deposited when it escapes. After the escape of the gas, these waters have a flat, insipid taste; but when taken whilst strongly charged with it, they are refreshing and exhilarating, even almost to inebriety.

The kind of cases to which this class of springs is applicable depends upon their further constitution. The effect of the gaseous principle is to allay irritability of the digestive system, to increase and modify the secretion of the kidneys, and to excite the nervous system. Besides this, it imparts an increased activity to the other ingredients, rendering them more powerful in their effects upon the system. Such springs should be administered cautiously at first, for they sometimes produce unpleasant symptoms, of which fulness in the head is the chief. They should never be administered during active febrile or inflammatory conditions, nor where there is a tendency to apoplexy. They are largely used in cases of chronic irritable dyspepsia, and also to allay spasmodic action of the stomach and bowels, to arrest vomiting arising from functional causes, to quench the thirst attending chronic affections of the digestive organs, and generally to increase the powers of digestion, and to give an impulse to functional activity in all disorders consequent upon an atonic state of the abdominal viscera. Gaseous or acidulous waters are more commonly cold than hot; and common spring water, charged with carbonic-acid gas, with or without the addition of artificial salts, is not unfrequently substituted for them. Artificial seltzers or seltzer water is frequently used. We have examples of the thermal variety of this class of mineral waters in the springs of Ems, Wiesbaden, Schlangenbad, Gurgitello (in the island of Ischia), St. Nectaire, Bath, Bristol, Buxton, &c.; and of the cold variety in the springs of Selters, Enghien, Apollinaris, Neuenbar, Vichy, Bilin, Marienbad, Geilnau.

2. *Sulphurous* or *Hepatic Waters* are characterised by the presence of hydrosulphuric acid, either in a free state or in combination in the form of a sulphuret. They are readily recognised by their disagreeable, fetid, rotten-egg-like odour, and their frequently bitter and saline, and always disagreeable taste. It is to the class of sulphuretted waters that the substances known as *glairine*, *baregine*, or *zoogine*, and *sulphuraire* belong. Sulphurous springs generally belong to the thermal class, and many of them have a very high temperature, but a few are cold. They usually contain also hydrochlorates, sulphates, and carbonates of soda, magnesia, and lime, and in some instances free carbonic-acid gas.

This class of mineral waters is more frequently used than any of the others, and is perhaps the most powerful variety that can be recommended as simple alteratives. The sulphurous waters act as excitants, quicken the circulation, and increase the functional activity of the skin and kidneys, producing free diaphoresis and a copious discharge of urine. At the same time they improve the appetite, and, according to the proportions of their ingredients, act as deobstruents and laxatives. Their use should be commenced with extreme caution, gradually increasing the dose if taken internally, or the duration of the bath when applied externally. If headache supervene, accompanied by a rapid pulse, with a feverish and sleepless state of the system, their use should be diminished, if not entirely suspended for a time. Their exhibition is indicated only in chronic states of disease. They are considered valuable remedial agents in chronic rheumatism; in chronic cutaneous diseases, especially in eczema, impetigo, psoriasis, lepra, prurigo, &c.; in many forms of functional affections of the uterus; in scrofula, in diseases of the joints, and in old cicatrices, especially those of gunshot wounds; in advanced stages of syphilis; in the elimination of cumulative medicines, such as mercury; in some forms of chronic bronchial and pulmonary affections, &c. Their internal administration may be combined with their local use in the form of baths, but their action is mainly due to the warm water, and not to the action of the mineral *constituents* on the skin or their absorption, because the solution is too dilute to exercise any local action, and too little, if any, is absorbed to affect the system. We have examples of sulphurous waters in the thermal springs of Aix-la-Chapelle, Aix (Savoie), Baden (Austria), Schinznach, Barèges, Eaux-Bonnes, St. Sauveur, Cauterets, Bagnères-de-Luchon, Bagnères-de-Bigorre, &c.; and in the cold springs of Enghien, Weilbach, Harrogate, Moffat, Strathpeffer, &c.

3. *Alkaline Waters* are characterised chiefly by the presence of carbonate and bicarbonate of soda in considerable quantity, and, in a less degree, by the presenee of the carbonates of lime and magnesia. They contain also a variety of mineral ingredients besides these; but it is to the carbonates of soda especially that they owe their medicinal reputation. They are usually more or less charged with free carbonic-acid gas, so as to belong in part to the class termed *gaseous* or *acidulous*. These waters allay irritability of the mucous membrane lining the digestive apparatus, due to the presence of an uncombined acid; they are sedative in their effects upon the nervous system generally; and act also, like other varieties of mineral water, by increasing the functional activity of the skin and kidneys. They are recommended in certain kinds of dyspepsia complicated with acidity; in chronic bronchial and pulmonary affections; in chronic cutaneous affections; in certain calculous disorders; in diabetes and Bright's disease of the kidney; in gout; in glandular enlargements; in organic and functional diseases of the uterus, &c. Their exhibition requires extreme caution, not only in the selection of a suitable spring, but also in the mode of administering the waters. The *Grand Grille* at Vichy is the principal spring of this kind, and we have other examples in the thermal springs of Ems, Mont Dore, Ischia, &c., and in the cold springs of Bilin, Vals, Ilkestone, Malvern, &c.

4. *Chalybeate, Ferruginous, Martial,* or *Tonic Waters* are characterised by the presence of iron, usually in the form of carbonate, but sometimes as a sulphate. The carbonate of iron is held in solution by an excess of carbonic-acid gas, which, on the escape of the water from the ground, is readily liberated, leaving the oxide of iron as a red deposit, so common in the vicinity of these springs. These waters are recommended in all cases showing a want of red blood—that is, in anæmia, in scrofula, and other vitiated conditions of the system; in functional disorders of the uterine system; in chlorosis; in hysteria, epilepsy, chorea; in spermatorrhœa; in local nervous pains; and in many other affections in which the use of iron is indicated. The bowels should be carefully regulated during their administration, and their use should be suspended upon the appearance of head symptoms. This variety has so many representatives that it is

almost impossible to make a small selection. The springs of Mont Dore, St. Nectaire, Vichy, Töplitz, and Bath may pass for examples of the thermal class, and Pyrmont, Spa, Tunbridge, Hartfell, &c., for the cold variety.

5. *Bromo-ioduretted Springs* contain iodide of sodium and bromide of magnesium, associated with more or less of chloride of sodium, and other saline ingredients. Sea-water contains these principles, and is probably more useful, considering the conjoined advantages of sea-air and sea-bathing, than any of the springs recommended for the sake of their iodine and bromine. These waters are employed in strumous affections, in which they exercise a beneficial effect, especially apparent where there is marked glandular or cutaneous manifestation of the disorder. They are also used in cases of goitre, in uterine affections, in visceral congestions, and occasionally in rheumatism and gout. The action of these waters depends principally upon the chloride of sodium and other salts, and not upon the iodine and bromine, they act as stimulants locally, and internally increase functional activity, assimilation, and tissue metamorphosis, hence their use in strumous and glandular diseases. We have examples of this variety in the springs of Kreuznach, Kissingen, Homburg, Hall, Aix (Savoie), Castel Nuovo, Durckheim, Krankenheil, Woodhall, &c.

6. *Saline Waters* contain a variety of salts ; in short, all mineral waters are saline, but for the sake of easier description they are usually divided, according to the acids which enter into their constitution, into carbonated, muriated or hydrochlorated, and sulphated waters. Waters containing free carbonic-acid gas have been considered under the head of gaseous, acidulous, or carbonated waters, and those containing the carbonates of soda in excess have been mentioned as alkaline waters. The *Muriated Saline Springs* are characterised by the presence of chlorides or muriates in preponderating quantity, although they may be associated with other ingredients, to which chiefly their medicinal reputation is attributable. Their principal ingredients are muriates of soda, lime, and magnesia, to which may be added in smaller quantities the carbonates and sulphates of soda, lime, magnesia, and iron, together with bromides and iodides, as well as a certain amount of free carbonic-acid or sulphuretted-hydrogen gas.

Their action is alterative, slightly purgative, and tonic, and they are employed in a variety of diseases, according to their natural combination with specific remedies, such as iron, sulphur, iodine, bromine, &c. Waters that contain chloride of sodium in great excess are called *brines* or *salt waters;* they are seldom used internally, and only when well diluted; but in the form of baths they are extensively employed. Waters, whose chief ingredients are the sulphate and carbonate of lime, are called *calcareous* or *earthy waters.* The *sulphated salines* are characterised by the presence of sulphates in excess. They usually contain either the sulphates of soda (Glauber salts), of magnesia (Epsom salts), or of lime, frequently associated with the sulphate of potash, the muriates of soda and magnesia, and the carbonates of soda, lime, magnesia, or iron, together with more or less of free carbonic-acid gas. In the case of the Sandrock Spring, in the Isle of Wight, the sulphate of iron is in excess. Their action is aperient and alterative, and they are generally heavy of digestion, unless mixed with carbonic-acid gas. They are employed in cases requiring interference in the action of the secreting and excreting organs, to which they impart a decided stimulus, and through them relieve the system of many disorders. Those waters which contain the sulphates of soda and magnesia in excess are called *bitter* or *purging* waters. Of saline springs the following are examples :—

1. *Simple Muriated Waters.*—Wiesbaden, Baden-Baden, Balaruc, Bourbonne-les-Bain, Niederbronn, Luxeuil, Kissingen, Homburg, Pyrmont, Cheltenham, Leamington, &c. 2. *Brines* or *Salt Waters,* sea-water—Rehme, Nauheim, Kreuznach, Salzhausen, Ashby-de-la-Zouch, Middlewich, Nantwich, Droitwich, &c. 3. *Calcareous* or *Earthy Waters*—Wildungen, Leuk, Lucca, Weissenburg, Lippspringe, Pisa, Bath, Buxton, Bristol, &c. 4. *Bitter* or *Purging Waters* — Saidschütz, Sedlitz, Pullna, Kissingen, Friedrickshall, Epsom, Leamington, Cheltenham, &c.

Another class may be added here, viz. indifferent thermal springs, which have nothing to recommend them but a more or less elevated temperature, and have gained a certain reputation in the treatment of paralytic affections, and gout and rheumatism. Examples—Plombiéres, 66·2° = 143° F.; Teplitz, 95·5° = 108·5° F.; Gastein, 90·5° = 104° F.; Tuffes, 95° = 102·2° F.; Warmbrunn, 104·9° F.; Wiesbaden, 93·2° = 104° F. In England—Bath, 104° = 120° F.; Buxton, 82° F.; Bristol, 72° F.; Clifton, 74°; Matlock, 68°.

*Mud Baths* are formed of the soft earthy substances brought by certain mineral waters to the surface of the earth, and there deposited. They are applied either locally or generally, and in many diseases are considered to be more active than the waters themselves. They are used at many of the bathing establishments, such as Dax, Barbotan, St. Amand, Acqui, &c., in a variety of diseases, of which chronic rheumatism, cutaneous affections, indolent ulcers, pseudo-anchylosis, injuries and diseases of the joints, bones, &c., are examples.

*Sea-Water and Sea-Bathing.*—Sea-water is richly charged with a diversity of saline ingredients. It is sometimes taken internally, when its effects vary according to the quantity imbibed. In doses of half-a-tumbler, occasionally repeated, it is alterative and tonic; in larger doeses it is purgative, and as such is frequently employed as a deobstruent in congestion of the abdominal viscera. *Sea-bathing* is employed both in preventive and curative medicine. In the former it cleanses the skin, and renews its elasticity and contractility, thereby imparting additional vigour and activity to the frame, and lessening the tendency to take cold during exposure to vicissitudes of temperature. In the latter it operates much in the same way, adding firmness and tone to the textures, and so increasing the functional activity of the vascular, nervous, and secretory systems. In all cases showing impaired functional powers, without any manifestation of inflammatory symptoms—in short, in those cases in which the exhibition of alteratives and tonics is indicated—sea-bathing may, with proper precautions, be resorted to. It is contra-indicated in persons of plethoric habit of body, in cerebral congestion, in organic disease of the heart, in aneurism, and, indeed, in such cases as have not the ability to encounter the severe shock; and, moreover, at certain periods in which the female constitution is not prepared for the application of powerful remedies.

*Factitious Mineral Waters* were formerly much employed in cases in which the patients could not be conveniently removed to the springs, and many formulæ have been constructed for the imitation of the more popular waters; but the means of transport between different countries are now so greatly increased, that the mineral waters of any district can be readily and cheaply imported. It is, however, certain that mineral waters act most beneficially when taken at the springs, probably because of the adjuvant circumstances of change of climate, scenery, habits, &c.

## NITROGEN (N=14).

*Preparation.*—Nitrogen may be readily obtained by burning phosphorus in confined air, or by otherwise depriving atmospheric air of its oxygen.

*Characters.*—It is a permanent, colourless, tasteless, inodorous gas, having a specific gravity of 0·967. It does not support combustion; and although it is an essential constituent of atmospheric air, it cannot be respired in a pure state without destroying life—a result due, probably, rather to the absence of oxygen than to any poisonous effects of the nitrogen itself.

*Therapeutics.*—It has been recommended, mixed with common air, as a sedative in certain pulmonary affections, but it is not used alone as a therapeutic agent. As a constituent of the *flesh-forming* principles, it is an essential article of diet.

Protoxide of Nitrogen ($N_2O$).—Nitrogenii Protoxydum—Laughing Gas—produces remarkable effects when respired by man. It generally gives rise to a kind of temporary delirium, accompanied by an exuberance of muscular activity, which takes the form of dancing, fighting, singing, &c., according to the natural proclivity of the individual. It has been used therapeutically in spasmodic asthma, paralysis, and other diseases, but is now rarely employed in the treatment of such affections. It is possessed of valuable anæsthetic properties, and has lately come into very general use in dentistry operations, where it has in a great measure superseded chloroform. Though not absolutely free from danger, it has proved itself much safer in this branch of surgery than chloroform. It induces complete unconsciousness usually in about 60 seconds; but its effects pass off in about 30 seconds, so that it is best suited for rapid operations, where only one or two teeth have to be extracted. It acts essentially in producing a temporary asphyxia, the lips become blue, the pupils dilate, and the breathing stertorous. For inhalation it needs to be perfectly pure, and also requires a special apparatus. For tedious operations the gas is sometimes given repeatedly at one sitting, but most dentists under such conditions rather prefer chloroform.

**CHLORINE** (Cl = 35·5 *χλωϱός, green*). Chlorum—Chlorinium.

*Characters.*—Chlorine gas has a yellowish-green colour, a pungent, suffocating odour, so that it cannot be respired unless it be sufficiently diluted, and a somewhat astringent taste. It can be reduced to a liquid under a pressure of four atmospheres at a very low temperature. Its specific gravity is 2·47; it is soluble in water, and, in the presence of moisture, destroys vegetable colours. With nitrate of silver, it gives a curdy white precipitate, which is insoluble in dilute nitric acid, but soluble in ammonia.

Vapor Chlori.—Inhalation of chlorine.

Preparation.—*Take of chlorinated lime, 2 ounces; water (cold), a sufficiency. Put the powder into a suitable apparatus, moisten it with the water, and let the vapour that arises be inhaled.*

**Liquor Chlori.**—Chlorine Water—Chlorine gas dissolved in half its volume of water, and constituting 0·006 of the weight of the solution.

PREPARATION.—*Take of hydrochloric acid, 6 fluid ounces; black oxide of manganese, in fine powder, 1 ounce; distilled water, 34 fluid ounces. Put the oxide of manganese into a gas-bottle, and having poured upon it the hydrochloric acid, diluted with two ounces of the water, apply a gentle heat, and, by suitable tubes, cause the gas, as it is developed, to pass through two ounces of the water placed in an intermediate small phial, and thence to the bottom of a three-pint bottle containing the remainder of the water, the mouth of which is loosely plugged with tow. As soon as the chlorine ceases to be developed, let the bottle be disconnected from the apparatus in which the gas has been generated, corked loosely, and shaken until the chlorine is absorbed. Lastly, introduce the solution into a green-glass bottle furnished with a well-fitting stopper, and keep it in a cool and dark place.*

*Characters.*—A yellowish-green liquid, smelling strongly of chlorine, and immediately discharging the colour of a dilute solution of sulphate of indigo.

The liquid is clear, has the choking property of chlorine, and a feebly styptic taste. It dissolves gold leaf, and discharges the colour from litmus and other vegetable substances.

*Therapeutics.*—Liquor Chlori, when administered of full officinal strength, acts as a powerful irritant, causing inflammation of the skin when applied externally, and acting as an irritant poison when taken internally, causing gastro-enteritis. Antidotes—albumen, as white of egg, milk, flour, lime-water, chalk, soap, and magnesia. When sufficiently diluted, it operates as a stimulant and alterative, besides exercising to a certain extent the disinfectant and antiseptic properties of the undiluted gas. It has been said to cause salivation after long administration. It has been recommended internally in the lowest forms of fever having a malignant tendency, or in which the fluids are believed to possess a special tendency to putrescency, such as typhus, typhoid, smallpox, and scarlatina; also in certain chronic diarrhœas, in epidemic dysentery, in erysipelas, and as an alterative in chronic diseases of the liver and in syphilitic affections. Dose of the liquor, 10 to 30 drs., well diluted in water. It has also been used as an application in cutaneous affections, including certain forms of herpes and psoriasis, tinea, porrigo, scabies, &c., and it has been applied at the period of eruption in variola. It is useful as a stimulating and antiseptic application to cancerous and sloughing ulcers. It is a deodoriser by liberating hydrogen, and thus it destroys $NH_3$, $H_2S$, and sulphide of $NH_4$, on which the odour of decomposing animal and vegetable substances depends; and antiseptic by destroying the germs of disease, by oxidising them. As a gargle, it is serviceable in malignant sore-throat and aphthous and other ulcerations of the mouth and fauces. As an antidote, it has been recommended in cases of poisoning by hydrocyanic acid, sulphuretted hydrogen, sulphide of ammonium—in the former by rousing the system, and in the latter by precipitating the S, and forming HCl.

**Calx Chlorata** — Calx Chlorinata — Chlorinated Lime — A product obtained by exposing slaked lime to the action of chlorine gas as long as the latter is absorbed. It possesses bleaching and disinfecting properties.

*Characters.*—A dull white powder, with a feeble odour of chlorine, partially soluble in water. The solution evolves chlorine copiously upon the addition of oxalic acid, and deposits at the same time oxalate of lime.

LIQUOR CALCIS CHLORATÆ.—SOLUTION OF CHLORINATED LIME.—*Take of chlorinated lime*, 1 *pound; distilled water*, 1 *gallon. Mix well the water and the chlorinated lime by trituration in a large mortar, and, having transferred the mixture to a stoppered bottle, let it be well shaken several times for the space of three hours. Pour out now the contents of the bottle on a calico filter, and let the solution which passes through be preserved in a stoppered bottle.*

*Therapeutics.*—Calx Chlorata acts upon the system perhaps in essentially the same manner as liquor chlori, but is principally used externally. It acts as an irritant, antiseptic, and disinfectant. As a local stimulant and purifying agent in unhealthy and fetid sores. In solutions of various strengths it may be applied as a gargle in malignant sore-throat, and as a wash in ulcers of the mouth, tongue, gums, and lips, and also in mercurial ptyalism ; as an injection in fetid discharges from the nose and ears ; and, well diluted, as a topical application in purulent ophthalmia ; as a lotion in cancerous and other ulcers producing fetid discharges ; as an injection in fetid discharges from the uterus, vagina, or rectum ; as an application to cutaneous affections, especially scabies ; and as a local application to the skin in erysipelas ; as an application to glandular swellings and sores of a scrofulous nature.

**Liquor Sodæ Chloratæ**—Solution of Chlorinated Soda.

PREPARATION.—*Take of carbonate of soda*, 12 *ounces; black oxide of manganese*, 4 *ounces; hydrochloric acid*, 15 *fluid ounces; distilled water*, 2 *pints. Dissolve the carbonate of soda in thirty-six fluid ounces of the distilled water, and put the solution into a glass vessel.*

*Mix the oxide of manganese and hydrochloric acid in a glass flask, with a bent tube attached by means of a cork to its mouth, apply a gentle heat, and, with a suitable arrangement of apparatus, cause the gas which is evolved to pass first through a wash-bottle containing four ounces of water, and then into the solution of carbonate of soda, regulating the heat so that the gas shall be slowly but constantly introduced. When the disengagement of chlorine has ceased, transfer the solution, in which it has been absorbed, to a stoppered bottle, and keep it in a cool and dark place.*

*Characters.*—A colourless alkaline liquid, with astringent taste and feeble odour of chlorine. It decolorises sulphate of indigo. It effervesces with hydrochloric acid, evolving chlorine and carbonic acid, and forming a solution which does not precipitate with perchloride of platinum.

CATAPLASMA SODÆ CHLORATÆ—CHLORINE POULTICE.—*Take of solution of chlorinated soda,* 2 *fluid ounces; linseed meal,* 4 *ounces; boiling water,* 8 *fluid ounces. Mix the linseed meal gradually with the water, and add the solution of chlorinated soda with constant stirring.*

*Therapeutics.*—Liquor Sodæ Chloratæ is used both internally and externally for the same purposes, and in a similar class of cases, as was mentioned under chlorine water and calx chlorata; but for internal purposes, and in certain cases of local treatment, it is generally preferred to the solution of calx chlorata. Dose internally, xx. to xxx. mins.; externally as a lotion or gargle, ʒi. to ℥f. to ʒii. of water.

## GROUP II. LIQUID—BROMINE.

**BROMINE** (Br=80; βρώμος, a stench). Bromum—A liquid non-metallic element obtained from sea-water, and from some saline springs.

*Preparation.*—After all the salts that are capable of separation by crystallization have been removed from the mother-liquor of sea-water, there still remains in it bromine, principally in the form of bromide of magnesium. In order to obtain bromine in its elementary form, the bromide is decomposed by subjecting the liquid to the influence of chlorine, which, seizing upon the magnesium to form chloride of magnesium, sets the bromine free. Sulphuric ether is next agitated with the liquid: this abstracts the bromine. The ethereal solution of bromine is separated from the mother-liquor, and is agitated with a solution of hydrate of potash, whereby bromide of potassium and bromate of potash are formed in solution. The ether is then recovered, the salts of potash are dried by evaporation, and are exposed to a dull red heat, in order to convert, by deoxidation, the bromate of potash into bromide of potassium. The bromide is next mixed with peroxide of manganese, sulphuric acid, and water, and distilled into a cold receiver, where the orange-coloured vapour is condensed into liquid bromine ($2H_2SO_4+2KBr+MnO_2=K_2SO_4+MnSO_4+2H_2O+Br_2$).

*Characters.*—A dark brownish red, very volatile, liquid, with a strong and disagreeable colour. At the common temperature of the air it gives off red vapours, and at a temperature of 117° it boils.

The odour of bromine, from which it derives its name, is very offensive. Its vapour resembles in colour that of peroxide of nitrogen, and causes great irritation when brought in contact with the living tissues. It is very heavy, having a specific gravity of 5·395. Bromine, like chlorine, bleaches certain vegetable colours in the presence of moisture; but when quite dry it does not remove their colour, so that its bleaching property is probably due to its affinity for hydrogen, the oxygen of the $H_2O$ being set free to operate in its nascent state as a decoloriser. It is but very slightly soluble in water, imparting to it a yellow colour; is more ready soluble in alcohol, and still more so in ether. It combines with many of the metals to form bromides. It stains the skin yellow, and gives an orange-yellow colour with starch. It should be preserved under a layer of water in a stoppered bottle.

*Therapeutics.*—Bromine in its elementary form is little used in medicine. Medicinally, it may be said to occupy a position mid-way between chlorine and iodine, inclining rather more towards the former, and being relatively stronger than the latter. The vapour of bromine is exceedingly irritant, and in its pure state is irrespirable. When somewhat diluted, it causes great irritation of the air passages, attended by dyspnœa, cough, hoarseness, and an increased flow of the secretions from the eyes, nose, and throat. It acts partly by its topical irritant action, and partly by its absorption into the circulation. In larger doses it is irritant and caustic. In full poisonous doses bromine causes intense pain in the stomach and bowels, with difficult deglutition and dyspnœa, painful vomiting and purging, and ultimately fatal collapse. In large and continued doses it causes general debility and languor, with headache, colicky pains, diarrhœa, and sometimes salivation. It is principally used locally as a caustic to gangrenous and sloughing sores and cancer of the uterus.

The cases in which solution of bromine has been used internally are those of a scrofulous character, in which it is both given internally and applied locally, as to enlargement of the glands, to tumours of various kinds, and to scrofulous ulcers. Bromine has also been employed in affections of the spleen, in ventricular hypertrophy, in bronchocele, in eczema, and in carbuncle, &c. But bromine is rarely used otherwise than in the form of one of its salts.

## Bromide of Potassium (KBr). Potassii Bromidum.

PREPARATION.—*Take of solution of potash, 2 pints; bromine, 4 fluid ounces, or a sufficiency; wood charcoal, in fine powder, 2 ounces; boiling distilled water, 1½ pint. Put the solution of potash into a glass or porcelain vessel, and add the bromine in successive portions, with constant agitation, until the mixture has acquired a permanent brown tint. Evaporate to dryness; reduce the residue to a fine powder, and mix this intimately with the charcoal. Throw the mixture, in small quantities at a time, into a red-hot iron crucible, and when the whole has been brought to a state of fusion, remove the crucible from the fire and pour out its contents. When the fused mass has cooled, dissolve it in the water, filter the solution through paper, and set it aside to crystallize. Drain the crystals, and dry them with a gentle heat. More crystals may be obtained by evaporating the mother-liquor and cooling. The salt should be kept in a stoppered bottle.*

*Characters.*—In colourless cubical crystals, with no odour, but a pungent saline taste, readily soluble in water, less soluble in spirit. Its aqueous solution gives a white crystalline precipitate with tartaric acid. When its solution in water is mixed with a little chlorine, chloroform agitated with it, on falling to the bottom, exhibits a red colour.

*Therapeutics.*—The Bromide of Potassium has, within the last few years, become one of the most frequently-used medicines. Though, no doubt, some properties have been attributed to it which it does not possess, yet it is unquestionably one of the most valuable recent additions to the *Materia Medica.* Introduced into medicine in this country by Dr. R. Williamson, in 1831, for the treatment of certain splenic and hepatic enlargements, it took little hold on the profession at large till recommended by Sir Charles Locock, in 1853, as the best treatment for hysterical epilepsy and nymphomania. Since that period, it has been gradually gaining ground, and the sphere of its applicability steadily widening.

Physiologically, it is a direct nervine sedative and depressant, having no preliminary period of excitement like opium and belladonna. It calms and slows the circulation generally, diminishes vascularity of the capillary network, and lessens heat production. It depresses the cerebral functions by causing anæmia, probably; it lowers reflex excitability of the spinal cord, and impairs the irritability of the motor and sensory nerves. Large doses cause drowsiness and tendency to sleep, and diminish excitement of the sexual organs. It also exerts an anæsthetic effect upon tactile sensibility generally, but more especially upon the mucous membranes of the velum palati, the pharynx, the conjunctiva, and the urethra.

When full doses have been administered for some time, a group of symptoms collectively termed bromism occur, viz. depression of spirits, mental weakness, pallor, and anæmia—an eruption of acne, fœtid breath, and feeble heart's action. In addition there may be muscular weakness, a feeling of coldness, diminished sensibility of the skin and mucous membrane, so that irritation of the fauces is not felt, and usually there is abolition of the sexual functions. In every case all these symptoms are not present, but if the remedy is pushed they are all developed.

Therapeutically, it is employed as a sedative to allay irritation generally, to quiet cerebral excitement, to diminish over-susceptibility of the spinal centres to reflex actions, or of the peripheral afferent nerves which lead to these centres, to subdue excitement of the genital system, and diminish congestion. It is contra-indicated in very feeble or exhausted individuals :—

1. As a sedative, it is employed with the best results in the treatment of epilepsy (whether due to functional or organic cause), in puerperal convulsions, chorea, tetanus, laryngismus stridulus, hooping cough (when uncomplicated with chest disease), spasmodic asthma (functional or organic), cardiac palpitations, bronchitis, with painful cough, in irritable conditions of the pharynx and œsophagus; as a sedative and hypnotic in the pervigilia, so often the result of continued mental labour, in delirium tremens, in typhus and typhoid fever, &c.; as a sedative in neuralgic pains in the uterus, and to check profuse menstrual discharge, as it diminishes the amount of blood circulating in the pelvis.

2. As an anæsthetic, for furthering operations on the eye, on the velum palati, larynx, pharynx, œsophagus, and urethra; in painful rheumatic and gouty affections; in cephalgia.

3. As an alterative, it has been recommended in secondary and tertiary syphilis, but it is inferior to the preparations of iodine.

4. As a deobstruent, in glandular enlargements, and visceral

engorgements generally, it is of considerable use, but is is better combined with iodide of potassium; in fibroid tumours of the uterus (Sir James Y. Simpson), in acute hydrocephalus, in which case, also, it is better combined with the iodide.

5. As an anaphrodisiac in nymphomania, satyriasis, spermatorrhœa, and chordee.

It is probable that bromide of potassium acts by stimulating the vasomotor nerves to increased action, and that thereby it diminishes the vascularity of organs. It is therefore suitable as a sedative and hypnotic to cases presenting the symptoms of cerebral congestion, and not those of anæmia. It is possibly owing to its diminishing the vascularity of the uterus that it is beneficial in fibroid tumours and dysmenorrhæa. In the treatment of epilepsy, M. Legrand du Saule states that no appreciable results need be expected with doses less than 1½ drachms per diem, and it may often require to be raised to from 2 to 2½ drachms a-day. It is most useful in regular epileptic convulsions, especially in cases of sexual origin or from intemperance, but to be useful it must be given regularly, in full doses, and continued for some time after the convulsions have ceased. It may be combined with a little arsenic to prevent the occurrence of acne.

*Dose.*—Five to sixty grains in water, or a bitter infusion.

**Bromide of Ammonium** ($NH_4Br$)—AMMONII BROMIDUM. —May be prepared in the same manner as bromide of potassium, liquor ammoniæ being used instead of liquor potassæ.

*Characters.*—In colourless crystals, which become slightly yellow by exposure to the air, and have a pungent saline taste. May be sublimed unchanged by the application of heat. Readily soluble in water, less soluble in spirit.

*Dose.*—One grain for each year of the child's age in hooping cough; for adults, v to xv grains thrice a-day, in a suitable vehicle; or in occasional doses of xx or more grains.

*Therapeutics.*—The actions of bromide of ammonium are allied to those of the bromide of potassium, and it has been recommended in similar cases. But its action is not so powerful, and it differs from the bromide of potassium in having an action on the mucous membrane of the lungs, hence its use in hooping cough, asthma, &c. It is less likely to induce bromism than the potassium salt; and it has the same specific effect on the mucous membranes of the throat, &c.

## GROUP III. SOLID—IODINE, SULPHUR, CARBON, PHOSPHORUS.

**IODINE** ($I=127$; *ἰώδης, violet*, the colour of its vapour). Iodum.

A non-metallic element, obtained principally from the ashes of sea-weed.

*Preparation.*—Iodine exists in minute quantity in sea-water, from which it is abstracted by the marine plants, from whose tissues it is obtained for commercial purposes. It is prepared to a large extent in Glasgow from *kelp* (the ashes of burned sea-weed, chiefly *fuci* and *laminaria*), obtained from the Hebrides and Orkneys, and from the west coast of Ireland. The following is a sketch of the manufacturing process :—The sea-weed, sun-dried, and burned at a low heat, yields kelp, which is crushed, and then submitted to boiling water, which takes up about one-half of the substance. This solution is partially evaporated in open pans, whereby sulphates of potash and soda, carbonate of soda, and chloride of potassium are removed by crystallization. The liquid that remains—called *mother-liquor* or *iodine ley*—still contains sulphide of sodium, together with hyposulphite and carbonate of soda, and iodine, in the form of *iodide of sodium.* In order to separate the iodine, sulphuric acid is first added to the iodine ley, and it is allowed to stand for twenty-four hours; during this period there is an escape of carbonic-acid, sulphurous-acid, and sulphuretted-hydrogen gases, sulphate of soda being at the same time crystallized out and sulphur deposited. The supernatant liquor is next transferred to a leaden retort, heated to 140°, and a quantity of black oxide of manganese, in powder, is added; from this mixture iodine is carefully and slowly distilled, and is received into a series of spherical glass condensers, connected with the conducting tube of the still. The changes which take place are probably these—$2NaI+MnO_2+2H_2SO_4=Na_2SO_4+MnSO_4+2H_2O+I_2$.

*Characters.*—Laminar crystals of a peculiar odour, dark colour, and metallic lustre, which, when heated, yield a beautiful violet-coloured vapour; very sparingly soluble in water, but freely dissolved by alcohol, by ether, and by a solution of iodide of potassium. The aqueous solution strikes a deep blue colour with starch.

*Dose.*—Iodine is seldom administered in the pure form, but may be given in doses, gradually increased from half-a-grain to a grain, well diluted in water, after food, or the tincture or liquor in doses of 5 to 20 mins.

LINIMENTUM IODI.—LINIMENT OF IODINE.—*Take of iodine,* 1½ *ounce; iodide of potassium, ½ ounce; camphor, ½ ounce; rectified spirit,* 10 *fluid ounces. Dissolve the iodine and iodide of potassium and camphor in the spirit.*

LIQUOR IODI.—SOLUTION OF IODINE.

PREPARATION.—*Take of iodine,* 20 *grains; iodide of potassium,* 30 *grains; distilled water,* 1 *fluid ounce. Dissolve.*

This solution is a little more than one-third the strength of the liniment, and nearly twice the strength of the tincture. For purposes of mild counter-irritation, it may be used externally for the liniment, and it may be substituted, on account of its cheapness, for the tincture for internal use. Dose, internally, min. v-xx.

TINCTURE IODI.—TINCTURE OF IODINE.—*Take of iodine, ½ ounce; iodide of potassium, ¼ ounce; rectified spirit,* 1 *pint. Dissolve the iodine and the iodide of potassium in the spirit.*

The tincture may be given internally in doses gradually increased from min. x to xx or xxx, sufficiently diluted with water; but it is more commonly used as an external application, for which it is a mild preparation.

UNGUENTUM IODI.—OINTMENT OF IODINE.—*Take of iodine, iodide of potassium, of each,* 32 *grains; proof spirit,* 1 *fluid drachm; prepared lard,* 2 *ounces. Rub the iodine and the iodide of potassium well together, with the spirit, in a glass or porcelain mortar, add the lard gradually, and mix thoroughly.*

The iodine ointment is used as an external application to enlarged glands, &c.

VAPOR IODI.—INHALATION OF IODINE.

PREPARATION.—*Take of tincture of iodine,* 1 *fluid drachm; water,* 1 *fluid ounce. Mix in a suitable apparatus, and having applied a gentle heat, let the vapour that arises be inhaled.*

This preparation is suitable for chronic pulmonary affections, such as bronchitis and phthisis, which are often benefited by the stimulating effect of inhaled vapour of iodine.

*Therapeutics.*—Topically, iodine acts as an irritant and vesicant, causing more or less of local pain and general uneasiness, according to the strength and form of the preparation, and the delicacy of the structure to which it is applied. It stains the skin yellow or brown, and, according to the strength of the preparation or frequency of the application, either passes off, leaving the skin uninjured, or else causes its immediate vesication or gradual desquamation. When applied to serous and mucous membranes, as by injection into cavities, by inhalation, or by ingestion, it gives rise to irritation, varying in degree according to the quantity and strength of the preparation; when inhaled, it may cause irritation of the respiratory mucous membrane, accompanied by distressing cough, coryza, and flow of tears; when taken into the stomach, it may cause heat and constriction of the fauces and œsophagus, epigastric pain, vomiting, colic, salivation, &c.

Fatal cases of poisoning by iodine are rare. The symptoms are those attending irritation and inflammation of the alimentary mucous membrane; namely, heat and constriction of the fauces and gullet, with intense thirst, violent pain in the stomach and bowels, which is aggravated by retching, vomiting, and purging, utter prostration, and fatal collapse. One fatal result having occurred after injection of an ovarian cyst. When administered internally, whether free or combined as iodide of potassium, all we know of its physiological action is, that it modifies nutrition and acts as a stimulant to the lymphatic system, causing absorption. Hence, as an alterative, it is of great value in chronic scrofula with indolent enlargement of the lymphatic glands, in chronic enlargements of joints and bone affections. But for other purposes, as an alterative, iodide of potassium does equally well, if not better, as its action depends principally on the iodine which it yields to the system. But it differs from iodine in having no local or but very slight irritant action on the stomach, which is of great importance, as it is a remedy which usually requires to be administered for some time, hence it is much more frequently used, besides, it has a wider range of employment. In full medicinal doses continued for some time it produces a group of symptoms, which are collectively termed iodism. According to Rilliet, there are three stages of iodism—the first is characterised by gastric irritation; the second by ringing in the ears, coryza, headache, conjunctural inflammation, vomiting, and diarrhœa; the third by iodic cahexia, emaciation, palpitation, hypochondriasis, and wasting of testes and mammæ.

Sometimes one or other of the foregoing physiological effects is alone manifested: in some patients *coryza* invariably follows the use of iodine, or even iodide of potassium. Headache, tinnitus aurium, or impaired vision, may ensue. A marked increase of appetite is a common result; diuresis frequently follows its use; irritation of the bowels, with diarrhœa, sometimes requires the addition of opium; salivation is occasionally a consequence.

Iodine, in one or other of its forms, internally or externally, has been employed in the cure of more diseases than we have space even so much as to enumerate. Like many other remedies which have proved themselves trustworthy in certain maladies, it has suffered by being pressed into every kind of service. The diseases in which it has been of most use are those of a scrofulous or syphilitic character. Internally, and applied at the same time to the part, it is employed for the resolution of enlarged lymphatic glands, and for the healing and obliteration of scrofulous abscesses and ulcers. In all cases complicated with scrofula, the treatment of each of which depends to a certain extent upon the part affected—as the eye, ear, joints, bones, &c.—the use of iodine, or the iodides, is indicated. It is often advantageous to give along with it iron and cod-liver oil, especially in anæmia and badly-nourished individuals.

Internally, it is used with great advantage in the treatment of syphilis, in cases and in stages of the disease in which mercury is inadmissible, or has been used unavailingly; externally, it is applied to syphilitic nodes and gummata. Both internally and externally, it has been recommended in hypertrophies of a subinflammatory origin, in indurations, and ulcers of the breast, tongue, tonsils, ovary, uterus, &c. In many obstinate chronic cutaneous diseases, more especially if referable to syphilitic, arthritic, or strumous cause, it is of undoubted benefit. In phthisis, and chronic bronchitis, it has been recommended both in the solid form of the several iodides, and also in the form of iodine inhalation. In tubercular meningitis, in acute, sub-acute, and chronic rheumatism, in gonorrheal rheumatism, and in rheumatic gout, in affections of the liver and spleen, in chronic and sub-acute inflammations of serous membranes, as in pleurisy and peritonitis, in the kidney affection of scarlatina, as a substitute for nitrate of silver in erysipelas, as an injection into encysted tumours, in the radical cure of hydrocele, in various dropsies, and in very many more diseases, either given internally to act as an alterative and deobstruent, externally to act as a counter-irritant, discutient, or escharotic, or injected into cavities for the purpose of procuring their obliteration by setting up adhesive inflammation, iodine, in one or other of its forms, has been recommended.

In the cure of *goitre* or bronchocele, burned sponge and other remedies, as certain mineral springs, were used before it was known that they contained iodine; for the cure of this disease iodine is now most successfully used both internally and externally.

In acute inflammatory and febrile attacks, especially where there is an irritable condition of the alimentary mucous membrane, the preparations of iodine are generally contra-indicated.

## **Iodide of Potassium** ($KI$). Potassii Iodidum.

PREPARATION.—*Take of solution of potash, 1 gallon; iodine, in powder, 29 ounces, or a sufficiency; wood charcoal, in fine powder, 3 ounces; boiling distilled water, a sufficiency. Put the solution of potash into a glass or porcelain vessel, and add the iodine, in small quantities at a time, with constant agitation, until the solution acquires a permanent brown tint. Evaporate the whole to dryness in a porcelain dish, pulverise the residue, and mix this intimately with the charcoal. Throw the mixture, in small quantities at a time, into a red-hot iron crucible, and, when the whole has been brought to a state of fusion, remove the crucible from the fire and pour out its contents. When the fused mass has cooled, dissolve it in two pints of boiling distilled water, filter through paper, wash the filter with a little boiling distilled water, unite the liquids, and evaporate the whole until a film forms on the surface. Set it aside to cool and crystallize. Drain the crystals, and dry them quickly with a gentle heat. More crystals may be obtained by evaporating the mother-liquor and cooling. The salt should be kept in a stoppered bottle.*

*Characters.*—In colourless, generally opaque, cubic crystals, readily soluble in water, and in a less degree in spirit. It commonly has a feebly alkaline reaction; its solution mixed with mucilage of starch gives a blue colour on the addition of a minute quantity of solution of chlorine. It gives a crystalline precipitate with tartaric acid.

*Dose of Iodide of Potassium.*—The dose ranges to a wide extent, even from two grains to half-a-drachm; commonly, from three to ten grains, thrice daily, in simple water or bitter infusions.

UNGUENTUM POTASSII IODIDI.—OINTMENT OF IODIDE OF POTASSIUM. —*Take of iodide of potassium, 64 grains; carbonate of potash, 4 grains; distilled water, 1 fluid drachm; prepared lard, 1 ounce. Dissolve the iodide of potassium and carbonate of potash in the water, and mix thoroughly with the lard.*

This ointment is used as an application to glandular enlargements; being colourless, it may be applied to exposed parts without disfiguring the patient, but its local action is very slight.

*Therapeutics.*—Iodide of potassium gives rise to the physiological symptoms collectively termed *iodism*, but being less irritant than pure iodine, it does not generally produce symptoms of gastric irritation. Coryza appears to be the most common physiological manifestation of its action, sometimes attended by swelled face. Salivation, emaciation, general or local, gastric irritation, with vomiting and purging, headache, &c., may also result from its use. But it is often given in large and long-continued doses without producing any untoward effects.

Iodide of potassium is more frequently given internally than any other preparation of iodine; and it has been recommended in the diseases mentioned under iodine, of which it possesses all the alterative, discutient, and deobstruent virtues. It is often beneficially administered in combination with bromide of potassium, with which it agrees in deobstruent action; while the bromide acts as a general and nervine sedative, and tends to diminish the capillary congestion.

In the treatment of *internal aneurism* it has lately been found exceedingly useful in alleviating the sufferings of the patients, and even in promoting a cure by consolidation of the tumour. Dr. George W. Balfour, from extensive trial of its virtues in this disease, is led to believe that its prolonged use in large doses (20 to 30 grains, thrice daily) leads to contraction of the aneurismal sac, probably by a sedative influence on the circulation, its action being aided by rest in the recumbent position. The iodide of potassium is the most valuable agent we have in the treatment of tertiary syphilis. It is also of use in the secondary stage of that disease. It is most effective in removing the pains of syphilitic nodes, and pains of all kinds referable to syphilitic tissue change. It is sometimes useful in sciatica, lumbago, cephalalgia, and chronic rheumatism, and in gout. It is of signal benefit in diseases of the liver, kidneys, spleen, and of internal organs generally, if the disease is associated with syphilis. It has been used successfully for the elimination of lead and mercury in cases of chronic poisoning by these substances; the iodide renders them soluble, and at first the symptoms of poisoning may be aggravated in consequence, but ultimately the patient is relieved. It is, however, necessary to prescribe iodide of potassium with great care to a patient who has been taking mercury recently, because injurious salivation is liable to occur in a certain proportion of such cases.

## Linimentum Potassii Iodidi cum Sapone—Liniment of the Iodide of Potassium and Soap.

PREPARATION.—*Take of hard soap, cut small, iodide of potassium, of each,* 1½ *ounce; glycerine,* 1 *fluid ounce; oil of lemon,* 1 *fluid drachm; distilled water,* 10 *fluid ounces. Dissolve the soap in* 7 *fluid ounces of the water by the heat of a water-bath. Dissolve the iodide of potassium and glycerine in the remainder of the water, and mix the two solutions together. When the mixture is cold, add the oil of lemon, and mix the whole thoroughly.*

## Iodide of Sulphur ($S_2I$)—Sulphuris Iodidum.

PREPARATION.—*Take of iodine, 4 ounces; sublimed sulphur, 1 ounce. Rub them together in a Wedgewood mortar until they are thoroughly mixed. Put the mixture into a flask, close the orifice loosely, and apply a gentle heat, so that the colour of the mass shall become gradually darkened. When the colour has become uniformly dark throughout, increase the heat so as to produce liquefaction. Then incline the flask in different directions, in order to return into the liquid any portion of the iodine which may have been condensed on the inner surface of the vessel. Lastly, withdraw the heat; and when the liquid has congealed, remove the mass by breaking the flask, reduce it to pieces, and keep these in a well-stoppered bottle.*

*Characters.*—A greyish-black solid substance, with a radiated crystalline appearance.

TESTS.—*It resembles iodine in smell, and in the property of staining the cuticle when applied to it. Soluble in about* 60 *parts of glycerine; insoluble in water, but decomposed when boiled with it. If* 100 *grains be thoroughly boiled with water, the iodine will pass off in vapour, and about* 20 *grains of sulphur will remain.*

## Ointment of Iodide of Sulphur—Unguentum Sulphuris Iodidi.

PREPARATION.—*Take of iodide of sulphur,* 30 *grains; prepared lard,* 1 *ounce. Triturate the iodine of sulphur in a porcelain mortar, and gradually add the lard, rubbing them together until the ointment is perfectly smooth and free from grittiness.*

*Therapeutics.*—This preparation has been occasionally used as an alterative internally, in doses of from one to six grains, and as vapour inhalation in cases of chronic bronchitis with emphysema. Its chief employment is, however, externally, as a stimulant and deobstruent application in squamous and tubercular forms of skin disease. It has been found advantageous in acne indurata and rosacea, in herpes labialis pustulosus, in chronic eczema, and psoriasis. It is applied in the form of ointment prepared as above.

## Iodide of Lead ($PbI_2$)—Plumbi Iodidum.

PREPARATION.—*Take of nitrate of lead, iodide of potassium, of each,* 4 *ounces; distilled water, a sufficiency. Dissolve the nitrate of lead, by the aid of heat, in* 1½ *pint, and the iodide of potassium in* ½ *pint of the water, and mix the solutions. Collect the precipitate on a filter, wash it with distilled water, and dry it at a gentle heat.*

### Iodide of Lead Plaster—Emplastrum Plumbi Iodidi.

PREPARATION.—*Take of iodide of lead, 1 ounce; soap plaster, resin, of each, 4 ounces. Add the iodide of lead in fine powder to the plasters, previously melted, and mix them intimately.*

### Ointment of the Iodide of Lead—Unguentum Plumbi Iodidi.

PREPARATION.—*Take of iodide of lead, in fine powder, 62 grains; simple ointment, 1 ounce. Mix thoroughly.*

Iodide of lead is seldom given internally, and it is still undetermined whether its characteristic actions incline more towards the iodine or towards the lead of its constitution. It has been given internally, in doses of from half-a-grain to two, three, or more grains, in the form of a pill; but it is chiefly used as an external application in the forms of the ointment and plaster. It is beneficial as an application to scrofulous affections of the glands, joints, &c., and to chronic cutaneous affections, especially those of the scalp.

### Iodide of Cadmium—($CdI_2$)—Cadmii Iodidum.

PREPARATION.—*It may be formed by direct combination of iodine and cadmium in the presence of water.*

*Characters.*—In flat micaceous crystals, white of a pearly lustre, which melt when heated to about 600°, forming an amber-coloured fluid. At a dull-red heat violet-coloured vapours are given off. It is anhydrous and permanent in air; freely soluble in water and in rectified spirit. The solution reddens litmus paper.

### Unguentum Cadmii Iodidi—Ointment of Iodide of Cadmium.

PREPARATION.—*Take of iodide of cadmium, in fine powder, 62 grains; simple ointment, 1 ounce. Mix thoroughly.*

The iodide of cadmium, in form of ointment, has been used as a stimulating friction application to scrofulous glands, chronic inflammation of joints, nodes, chilblains, and certain cutaneous eruptions. It was introduced by Dr. Garrod. It has the advantage over iodide of lead, with which it agrees in action, that it does not stain the skin yellow, and there is no danger of poisoning by absorption.

### Iodide of Iron—($FeI_2$)—Ferri Iodidum.

Iodide of iron, with about 18 per cent. of water, of crystallization, *and a little* oxide of iron.

PREPARATION.—*Take of fine iron wire*, 1½ *ounce; iodine*, 3 *ounces; distilled water*, 15 *fluid ounces. Put the iodine, iron, and twelve ounces of the water into a flask, and having heated the mixture gently for about ten minutes, raise the heat and boil until the froth becomes white. Pass the solution as quickly as possible through a wetted calico filter into a dish of polished iron, washing the filter with the remainder of the water, and boil down until a drop of the solution taken out on the end of an iron wire solidifies on cooling. The liquid should now be poured out on a porcelain dish, and, as soon as it has solidified, should be broken into fragments, and enclosed in a well-stoppered bottle.*

*Characters.*—Crystalline, green, with a tinge of brown, inodorous, deliquescent, almost entirely soluble in water, forming a slightly-green solution, which gradually deposits a rust-coloured sediment, and acquires a red colour. Its solution gives a copious blue precipitate with the red prussiate of potash; mixed with mucilage of starch, it acquires a blue colour on the addition of a minute quantity of solution of chlorine.

It has an acrid, astringent, or styptic taste. It is readily soluble in water and alcohol, from which, by careful evaporation, it may be obtained in green tabular crystals. The solution, when fresh, is of a green colour, slightly acid, and not unpleasant taste when sufficiently diluted; but it readily decomposes, yielding a rust-coloured sediment of peroxide of iron mixed with periodide, the fluid at the same time turning red from the presence of free iodine. This proves it to be a *proto*-salt of iron. The chlorine, by displacing the iodine, sets it at liberty to form blue iodide of starch, which proves the presence of iodine. The decomposition of the solution is prevented by the presence of sugar, so that the iodide can be well kept in the form of syrup. The solution can also be preserved by immersing a coil of iron wire in it, with part of which any free iodine would recombine to form iodide; but this does not prevent the deposition of peroxide of iron. The solid iodide may be preserved by covering it with a layer of pulvis ferri; and without this precaution, even in a well-stoppered bottle, it would be spoiled by the decomposition of its water.

*Dose.*—The iodide of iron may be given in doses of two to five or more grains, gradually increased, either dissolved in water, in cod-liver oil, when that is suitable to the patient, in syrup, or in pill.

PILULA FERRI IODIDI—PILL OF IODIDE OF IRON.—*Take of fine iron wire*, 40 *grains; iodine*, 80 *grains; refined sugar, in powder*, 70 *grains; liquorice root, in powder*, 140 *grains; distilled water*, 50 *minims. Agitate the iron with the iodine and the water in a strong stoppered ounce-phial until the froth becomes white. Pour the liquid upon the sugar in a mortar, triturate briskly, and gradually add the liquorice.*

When freshly prepared, about three grains of the mass will contain a grain of iodide of iron.

*Dose.*—Gr. j to v.

SYRUPUS FERRI IODIDI—Syrup of Iodide of Iron.—*Take of fine iron wire,* 1 *ounce; iodine,* 2 *ounces; refined sugar,* 28 *ounces; distilled water,* 13 *fluid ounces. Prepare a syrup by dissolving the sugar in ten ounces of the water with the aid of heat. Digest the iodine and the iron wire in a flask, at a gentle heat, with the remaining three ounces of the water, till the froth becomes white; then filter the liquid while still hot into the syrup, and mix. The product should weigh two pounds eleven ounces, and should have the specific gravity* 1·385.

*It contains* 4·3 *grains of iodide of iron in one fluid drachm.*

*Dose.*—Min. xv to lx.

Such a delicate preparation should always be made with distilled water, as the Pharmacopœia directs. The iron wire should be perfectly clean, and the sugar should be the purest. Decomposition is prevented by keeping an iron wire in the solution, and having the bottle well closed.

*Therapeutics.*—Iodide of iron unites the tonic and chalybeate properties of iron with the alterative and deobstruent action of iodine, and its use is indicated in those cases of scrofula and anæmia, for the individual cure of which these constituents are separately administered. It is apt to cause local irritation if given in too large doses at first, or when too long continued; vomiting, catharsis, diuresis may follow in such cases; also the head symptoms which sometimes arise during the exhibition of chalybeates. It is given as an alterative and tonic to scrofulous children; as an emmenagogue to women of similar constitution, affected with irregularities of the catamenia, leucorrhœa, and other functional and organic diseases of the uterus and ovaries; in chlorosis, in secondary syphilis, in phthisis, in albuminuria, in diabetes, in chronic cutaneous diseases, in debilitated scrofulous patients, &c. Iodide of iron is placed in this group because it is more of an iodine than of a ferruginous medicine; the proportion of iodine to iron being as 4·5 to 1.

**IODOFORM** ($CHI_3$)—Iodoformum — Teriodide of Formyl. This substance may be prepared by gradually adding chlorinated lime to an alcoholic solution of iodide of potassium heated to 104°, and stirring after each additional portion of the lime is added, till the liquid ceases to assume a dark-red colour. On cooling, iodate of lime and iodoform are precipitated in confused crystalline masses, and the iodoform is then dissolved out with boiling alcohol. From this solution the iodoform is deposited in small, pearly, yellow crystals, with an odour of saffron and a sweet taste.

Iodoform is insoluble in water, but soluble in alcohol, ether, chloroform, and the fatty, and volatile oils. It possesses little irritant action, though it contains nine-tenths of its weight of iodine. It exercises a marked anæsthetic action. It proves poisonous to the lower animals in smaller doses than iodine. It possesses the general deobstruent and alterative properties of iodine without having its local inconvenient effects, and has been used in syphilis, scrofula, goitre, and glandular enlargements. Externally, in scaly skin diseases, as an anodyne application to malignant tumours, and to inflammatory, rheumatic, or gouty painful swellings generally. As a suppository in chronic enlargements of the prostate gland, fissure of the rectum, piles, &c.

*Dose.*—Internally, two to three grains, in pill, thrice daily. Externally, as an ointment, one drachm to one ounce of lard. As a suppository, twenty grains to a sufficiency of the menstruum.

**SULPHUR** (S=32, *sal*, salt, and πῦρ, fire). Sulphur enters into the constitution of certain organic structures both of the animal and vegetable kingdom. It enters into the composition of the albuminoid or proteic compounds, and is met with in certain essential oils, such as those of mustard and horse-radish. In the mineral kingdom it occurs in the native or uncombined state either in a crystallized or amorphous form, chiefly in the vicinity of volcanoes. In combination with metals, it is abundantly distributed in the form of pyrites. Iron pyrites (bisulphide of iron) contains about 54 per cent. of sulphur, and from this sulphur may be obtained by distillation; but when thus prepared it is less pure than native sulphur, and is apt to contain arsenic. Sulphur is met with also in certain mineral springs, and in the oxidised condition of sulphuric acid it is found as a natural product in combination with various earths. The sulphur of commerce is chiefly derived from Sicily and Iceland, where it is met with in the native form in beds. It is afterwards refined by distillation and sublimation, and is known by the names of *stick*, *roll*, *sublimed*, or *flowers of* sulphur, according to the process of its purification.

**Sulphur Sublimatum.** Sublimed Sulphur—*Flowers of Sulphur*—Sulphur Lotum (*when washed*).

*Characters.*—A slightly-gritty powder of a fine greenish-yellow colour; without taste, and without odour, unless heated; burning in open vessels with a blue flame and the evolution of sulphurous acid.

**Sulphur Præcipitatum.** Precipitated Sulphur—Milk of Sulphur—*Lac Sulphuris.*

PREPARATION.—*Take of sublimed sulphur*, 4 *ounces; slaked lime*, 3 *ounces; hydrochloric acid*, 8 *fluid ounces, or a sufficiency; distilled water*, *a sufficiency. Heat the sulphur and lime, previously well mixed, in a pint of the water, stirring diligently with a wooden spatula; boil for fifteen minutes, and filter. Boil the residue again in half-a-pint of the water, and filter. Let the united filtrates cool, dilute with two pints of the water, and, in an open place, or under a chimney, add in successive quantities the hydrochloric acid, previously diluted with a pint of the water, until effervescence ceases and the mixture acquires an acid reaction. Allow the precipitate to settle, decant off the supernatant liquid, pour in fresh distilled water, and continue the purification by affusion of distilled water and subsidence, until the fluid ceases to have an acid reaction and to precipitate with oxalate of ammonia. Collect the precipitated sulphur on a calico filter, wash it once with distilled water, and dry it at a temperature not exceeding* 120°.

*Characters.*—A greyish-yellow soft powder, free from grittiness, and from the smell of sulphuretted hydrogen. When heated in an open vessel, it burns with a blue flame and the evolution of sulphurous acid.

*Dose.*—Sublimed or precipitated sulphur may be given in doses of ten to twenty or thirty grains as a stimulant; as a laxative, half-a-drachm to two drachms, or more, in treacle, syrup, milk, or confection.

CONFECTIO SULPHURIS.—CONFECTION OF SULPHUR.—*Take of sublimed sulphur*, 4 *ounces; acid tartrate of potash, in powder*, 1 *ounce; syrup of orange-peel*, 4 *fluid ounces. Rub them well together.*

*Dose.*—As a laxative, one to two drachms once or twice a-day; a teaspoonful or more morning and evening.

UNGUENTUM SULPHURIS.—OINTMENT OF SULPHUR.—*Take of sublimed sulphur*, 1 *ounce; benzoated lard*, 4 *ounces. Mix thoroughly. For external use* ad lib.

*Therapeutics.*—Sulphur acts as a stimulant, diaphoretic, and laxative In small doses (ten to twenty grains), frequently repeated, it stimulates the secreting organs, especially the skin and mucous membranes. In larger doses (a drachm and upwards) it acts as a gentle laxative, producing semi-liquid evacuations without pain or constitutional disturbance; its laxative effects are produced either by increasing the peristaltic action of the bowels, or by increasing the secretion from the mucous membrane of the intestines. A considerable quantity of the sulphur taken internally is carried off unchanged by the bowels, but part of it is absorbed into the circulation, and is eliminated partly in the form of sulphuric acid by the kidneys, and partly as sulphuretted hydrogen by the skin, the latter having the effect of blackening silver articles worn or carried about the person, and of rendering the exhalations from the body very offensive. When applied externally its effects are scarcely observable if the skin be whole, but if it be broken, the sulphur acts as a topical irritant. Internally, sulphur is useful as a laxative in hæmorrhoids, fissure, stricture, prolapsus, and other diseases of the rectum, because in these affections it is desirable to maintain the motions in a soft and liquid condition so as not to irritate the rectum by the passage of hardened fœces; it also acts locally on the rectal mucous membrane as a stimulant; it has been recommended in phthisis, chronic bronchitis, asthma, hooping-cough, and other chest affections; in acute and chronic rheumatism, &c. But its chief use is in many skin diseases, and especially in scabies. In these cases it may be both given internally and applied externally; but in the cure of itch its local application is all that is required. In combination with lime, in the form of a solution of sulphide or sulphuret of calcium (obtained as in the first stage of the preparation of precipitated sulphur), it is said to cure the disease by a single application, the patient being previously and subsequently well washed in a warm bath; but the sulphur ointment is too powerful in most cases, and should be diluted with lard or vaseline, and its odour may be concealed by the addition of Oil of Roses or Benzoic Acid; usually two or three applications are sufficient to cure the disease, applied directly to the affected parts; if the disease is chronic, the secondary eruption must be treated with other remedies. Sulphur fumigations are used in similar cases, also in lead poisoning, &c. For this purpose, the patient is placed in a suitable apparatus, somewhat in the form of a vapour-bath, great care being taken to protect the respiratory organs from the fumes by closing the apparatus round the neck. A deposit of sulphide of lead forms, which is carefully brushed off the skin; and by repeating this process a cure is ultimately effected. Factitious and natural sulphur baths are used for similar purposes.

**Sulphurous Acid** ($SO_2$). Acidum Sulphurosum—Sulphurous-acid gas dissolved in water, and constituting 9·2 per cent. by weight of the solution.

PREPARATION.—*Take of sulphuric acid,* 4 *fluid ounces; wood charcoal, broken into small pieces,* 1 *ounce; water,* 2 *fluid ounces; distilled water,* 20 *fluid ounces. Put the charcoal and the sulphuric acid into a glass flask, connected by a glass tube with a wash bottle containing the two ounces of water, whence a second tube leads into a pint bottle containing the distilled water, to the bottom of which the gas-delivery tube should pass. Apply heat to the flask until gas is evolved, which is to be conducted through the water in the wash bottle, and then into the distilled water, the latter being kept cold, and the process being continued until the bubbles of gas pass through the solution undiminished in size. The product should be kept in a stoppered bottle in a cool place.*

*Characters.*—A colourless liquid with a pungent sulphurous odour. Specific gravity 1·04. It gives no precipitate, or but a very slight one, with chloride of barium, but a copious one if solution of chlorine be also added.

*Therapeutics.*—Sulphurous acid acts as an irritant, disinfectant, antiseptic, and as a destroyer of certain parasitic vegetable growths which infest the human body. The attention of the profession was, during the years 1866-67, drawn specially to the virtues of this medicine by various observers. It is beneficial when inhaled in phthisis, bronchitis, catarrh, emphysema, &c., or when applied as spray in scarlet fever, diptheria, putrid sore throat, &c., and as a lotion and as spray in healing sores, weak and specific ulcers, lupus, chilblains, sore nipples, hæmorrhoids, &c. Though we fear its virtues have been overrated by some of its advocates, yet there is reason to believe that sulphurous acid is a good stimulant and antiseptic application to putrid sores generally, since by its deoxidising properties, it defends them from the influence of the oxygen of the air, while it tends, at the same time, to promote healthy action; also, that it is an expectorant of considerable value. In the latter case, it does not always succeed; but if it does, it acts invariably, after a little, as a sedative and calmative. It is also administered in those cases of dyspepsia and vomiting, in which the ejected matters contain *Sarcinæ ventriculi,* with the view of destroying the vegetable growth in the stomach. Externally, it is used in parasitic skin diseases. Lint soaked in the lotion, and covered with oil silk, may be applied, or the strong solution, with an equal part of glycerine, may be painted upon the part. The fumes of burning sulphur, in combination with steam, in the form of a vapour-bath, are employed for similar purposes, care being taken to protect the respiratory organs from their suffocating properties. Internally, sulphurous acid may be administered in doses of min. x, xxx, dissolved in water. Externally, it may be applied in lotion of from one of the acid to from two to eight parts of water or glycerine, according to the condition of the sore; or it may be applied in the form of spray, by means of the spray producer, and, in that case, the solution of the Pharmacopœia is suitable, undiluted. For inhalation, it is best to sprinkle a little flowers of sulphur over a clear coal in an iron shovel in the sick room, and inhale the sulphurous-acid fumes as they are formed.

SULPHITE OF SODA ($Na_2SO_37H_2O$)—Sodæ Sulphis. This may be prepared by saturating carbonate of soda with pure sulphurous-acid gas. It crystallizes in white prisms, which are soluble in four parts of water at 60°. *Bisulphite of Soda* is obtained by supersaturating a solution of carbonate of soda with pure sulphurous-acid gas. It crystallizes in four-sided rectangular prisms, has an acid reaction, and a sulphurous taste and odour. The sulphites of soda in doses of ten or twenty grains to a drachm, are given internally in cases of *Sarcinæ ventriculi*, $SO_2$ being evolved when the salt comes into contact with the acids of the stomach. In large doses, as a drachm to half-an-ounce, the sulphites act as purgatives. Externally, as lotions to parasitic skin diseases.

**Hyposulphite of Soda** ($Na_2S_2H_2O_4,4H_2O$)—Sodæ Hyposulphis. This salt may be prepared by digesting a solution of the sulphite with sulphur ($Na_2SO_3+S+H_2O=Na_2S_2H_2O_4$); or by passing sulphurous-acid gas through a solution of sulphide of sodium ($2Na_2S+3SO_2+2H_2O=2Na_2S_2H_2O_4+S$); or by other processes. It occurs in prismatic crystals, which have a bitter, saline, disagreeable taste; are inodorous, readily soluble in water, but not in alcohol; are decomposed by heat; and, on the addition of acids, are resolved into $SO_2$, which is evolved, and sulphur, which is deposited. When pure, 24·8 grains decolorise 1000 grain measures of the volumetric solution of iodine.

*Therapeutics.*—The experiments of Professor Polli on dead and living organisms led him to the conclusion that sulphurous acid, sulphites and hyposulphites of lime, soda, &c., are possessed of valuable antiseptic properties, which are capable of being utilised in medicine to prevent or modify the progress of diseases believed to be due to the action of morbid ferments in the blood. For this reason, he recommends the internal use of sulphites and hyposulphites in pyaemia, typhoid fever, glanders, &c. Now, though we may doubt the soundness of the pathological doctrine on which Polli proceeds, yet we have reason to believe that the sulphites exert, in many cases, beneficial effects in disease by their antiseptic action upon putrescent secretions, as in the case of alkaline urine from diseased bladder, and in diarrhœa with very offensive stools, &c. In small doses (ten or twenty grains to a drachm), hyposulphite of soda acts as an alterative, sudorific, and resolvent; in large doses (one or more drachms) it acts, like sulphate of soda, as a cathartic. In alterative doses it is given in *Sarcinæ ventriculi*, $SO_2$ being evolved when the salt comes into contact with the acids of the stomach. It is also used in a variety of diseases as a substitute for the natural sulphur waters; in cutaneous, scrofulous, hepatic, syphilitic, gouty, and rheumatic affections. Externally, in the form of lotion or as a bath (ʒ½-i to each gallon of water), in parasitic skin diseases. Sometimes a little dilute sulphuric acid is added to the lotions and baths in order to set the sulphurous acid at liberty; care must then be taken to protect the air-passages from the suffocating effects of the $SO_2$.

**Potassa Sulphurata.** Sulphurated Potash—Potassii sulphuretum—Hepar sulphuris—Liver of Sulphur.

PREPARATION.—*Take of carbonate of potash, in powder,* 10 *ounces; sublimed sulphur,* 5 *ounces. Mix the carbonate of potash and the sulphur in a warm mortar, and having introduced them into a Cornish or Hessian crucible, let this be heated, first gradually, until effervescence has ceased, and finally to dull redness, so as to produce perfect fusion. Let the liquid contents of the crucible be then poured out on a clean flagstone, and covered quickly with an inverted porcelain basin, so as to exclude the air as completely as possible while solidification is taking place. The solid product thus obtained should, when cold, be broken into fragments, and immediately enclosed in a green glass bottle, furnished with an air-tight stopper.*

*Characters.*—Solid greenish fragments, liver-brown when recently broken, alkaline, and acrid to the taste, readily forming with water a yellow solution, which has the odour of sulphuretted hydrogen, and evolves it freely when excess of hydrochloric acid is dropped into it, sulphur being at the same time deposited. The acid fluid, when boiled and filtered, is precipitated yellow by perchloride of platinum, and white by chloride of barium.

*Dose.*—Two to ten grains dissolved in water and sweetened, or in pills; externally, one or two drachms to a pint of water as a lotion; as an ointment, a drachm to an ounce of lard; as a bath, four ounces to thirty gallons of water.

UNGUENTUM POTASSÆ SULPHURATÆ, Ointment of Sulphuretted Potash.

PREPARATION.—*Take of sulphurated potash,* 30 *grains; prepared lard,* 1 *ounce. Triturate the sulphurated potash in a porcelain mortar, and gradually add the lard, rubbing them together until the ointment is perfectly smooth and free from grittiness.*

Should only be used when recently prepared.

*Therapeutics.*—Sulphurated potash appears to combine the properties of an alkali with those peculiar to sulphur when administered internally. When applied externally it acts as an irritant. Its effects as an internal remedy are modified by the contents of the stomach; if they be acid, decomposition takes place, sulphuretted hydrogen is evolved, and a mild neutral salt is formed. Usually it acts as a gentle stimulant, exciting the circulation, augmenting the heat of the surface, and giving an impulse to the secreting organs, especially the liver, the skin, and mucous membranes. It is stimulant, diaphoretic, and expectorant; but it is comparatively rarely given internally in this country. In large doses it acts as an acro-narcotic poison, and has on several occasions proved fatal: as such, it produces severe pain in the *primæ viæ*, vomiting, great depression, and convulsions, due to the action of the sulphuretted hydrogen. In smaller quantities it is apt to cause considerable gastric irritation, followed by nausea, vomiting, and hypercatharsis.

It has been employed internally, for the sake of its general stimulating properties, in certain forms of dyspepsia, in which the mucous follicles are affected, in the latter stage of hooping-cough, in chronic rheumatism, in chronic bronchitis, in croup, in catarrhus vesicæ, and in obstinate chronic cutaneous diseases. Externally, in the form of lotion bath, or ointment, it is applied in a variety of chronic skin diseases, in some of which it operates as an irritant, in others by its alkalinity, and in a third class, of parasitic origin, by the action of the sulphur in destroying the organisms. The solution has also been used, by injection into the mucous orifices, for the cure of mucopurulent discharges. The bath is used also for the cure of lead-poisoning; they are frequently repeated, so long as the skin continues to be blackened by them. Metallic vessels should be avoided in preparing the bath, those of wood or earthenware being preferable; and care must be taken to protect the patient from the effects of a too free evolution of sulphuretted hydrogen.

## CARBON (C=12).

Carbon is widely distributed throughout nature; it enters largely into the animal and vegetable kingdoms, and is an important constituent of the mineral kingdom. It is found in various states, as in the crystalline condition of the diamond, which is its purest form, in plumbago or graphite, in coke, which is the carbon of coal, and in charcoal, obtained either from animal or vegetable tissues; and all these substances are regarded as merely allotropic forms of the one elementary substance, *Carbon.*

It is now used only in the form of charcoal, of which there are two officinal varieties, *Carbo Ligni* and *Carbo Animalis.*

**Carbo Ligni**—Wood Charcoal—Vegetable Charcoal—Wood charred by exposure to a red heat without access of air.

PREPARATON.—*It is prepared by the combustion of billets of wood, chiefly oak, beech, hazel, or poplar, in covered heaps or in closed vessels, in such a manner as to prevent, as much as possible, the access of air. The* O, H, *and* N *of the vegetable structure are almost entirely driven off during the process, but the* C *in greater part remains. Wood yields from twenty to twenty-five per cent. of charcoal, consisting of carbon, with about two per cent. of vegetable ashes, chiefly carbonate of potash and lime.*

*Characters.*—In black, brittle, porous masses, without taste or smell, very light, and retaining the shape and texture of the wood from which it was obtained.

CATAPLASMA CARBONIS.—*Charcoal poultice. Take of wood charcoal, in powder,* ½ *ounce; crumb of bread,* 2 *ounces; linseed meal,* 1½ *ounce; boiling water,* 10 *fluid ounces. Macerate the bread in the water for ten minutes near the fire, then mix, and add the linseed meal gradually, stirring the ingredients, that a soft poultice may be formed. Mix with this half the charcoal, and sprinkle the remainder on the surface of the poultice.*

*Therapeutics.*—Charcoal acts the part of an antacid, disinfectant, deodoriser, &c.; its uses depending upon the power it has of condensing gases and vapours, especially $NH_3$, $H_2S$, and $CO_2$. It thus destroys the fœtor of decomposing animal and vegetable matter by its absorbing powers, and also by partially oxidising them, and is thus a disinfectant. It is administered internally for the relief which it affords in acidity of the *primæ viæ*, and in many disorders dependent upon acrid matters in the alimentary canal; and both internally and externally for the removal of fetid odours. In dyspepsia, gastrodynia, pyrosis, cardialgia, diarrhœa, dysentery, flatulence with constipation, or with hysteria, as a tooth powder, &c., the object in all such cases being either to give relief from acidity, flatulence, or acrid discharges, or to overcome the offensive odour of the breath or of the alvine evacuations. Externally, in the form of poultice, it is applied to cleanse and deodorise offensive ulcers, gangrene, phagedæna, &c. It is used also in the form of a respirator, as a protection against poisonous gases, also as a filter for the purification of water. For medicinal purposes it should be either recently prepared or be exposed to a high temperature to purify it. It may be given internally, in the form of biscuits or lozenges; but in these cases, it should be remembered that charcoal is only a palliative, and should therefore be combined with other remedies suitable for the cure of the disease. Dose, 10 grains to half-an-ounce.

**Carbo-Animalis Purifactus**—Purified Animal Charcoal—Bone Black deprived of its earthy salts. Bone black, ivory black, or impure animal charcoal is the powdered residue of ox and sheep bones, which have been exposed to a red heat, without the access of air. In this state it consists chiefly of phosphate and carbonate of lime, carburet and sulphuret of iron, and sulphuret of calcium, with from ten to twenty per cent. of charcoal, and to remove the salts in order to render it useful for pharmaceutical purposes is the object of the following purifying process:—

PREPARATION.—*Take of bone black, in powder,* 16 *ounces; hydrochloric acid,* 10 *fluid ounces; distilled water, a sufficiency. Mix the hydrochloric acid with a pint of the water, and add the bone black, stirring occasionally. Digest at a moderate heat for two days, agitating from time to time; collect the undissolved charcoal on a calico filter, and wash with distilled water till what passes through gives scarcely any precipitate with nitrate of silver. Dry the charcoal, and then heat it to redness in a closely-covered crucible.*

*Characters.*—A black pulverulent substance, inodorous, and almost tasteless. Tincture of litmus diluted with twenty times its bulk of water, agitated with it and thrown upon a filter, passes through colourless.

*Therapeutics.*—Animal charcoal is chiefly used as a decolorising agent in pharmacy and the arts, and but little as a medicine. But it may be employed in the same cases as wood charcoal. It has been recommended as an antidote in poisoning by certain alkaloids, as morphia, strychnia, aconitia; but it is exceedingly doubtful if it ever does more in such cases than simply entangle, and thus delay the absorption of the poison to a slight extent. Externally, to destroy the fetor of ulcers, &c.

## PHOSPHORUS (P=31. Φῶς, *light*, and φέρω, *I bear*).

Phosphorus is obtained first by the action of sulphuric acid upon calcined bones, and subsequently by distillation with charcoal, &c. The phosphate of lime of the bones is converted by the sulphuric acid into superphosphate and sulphate of lime; and again, the acid phosphate or superphosphate, when heated with charcoal, is changed into phosphate, carbonic oxide, water, and phosphorus.

*Characters.*—A semi-transparent, colourless, wax-like solid, which emits white vapours when exposed to the air. Specific gravity, 1·77. It is soft and flexible at common temperatures, melts at 110°, ignites in the air at a temperature a little above its melting point, burning with a luminous flame, and producing dense white fumes. Insoluble in water, but soluble in ether and in boiling oil of turpentine.

OLEUM PHOSPHORATUM.—*Phosphorated Oil.*—*Take of phosphorus and oil of almonds, each, a sufficiency. Heat the oil in a porcelain dish to* 300°, *and keep it at this temperature for about fifteen minutes, then let it cool, and filter it through paper. Put* 4 *fluid ounces of this oil into a stoppered bottle, capable of holding* 4½ *fluid ounces, and add to it twelve grains of phosphorus. Immerse the bottle in hot water until the oil has acquired the temperature of* 180°, *removing the stopper two or three times to allow the escape of expanded air, then shake the oil and phosphorus until the latter is entirely dissolved.*

*Characters.*—A clear and colourless, or but slightly-coloured, oil; phosphorescent in the dark.

PILULA PHOSPHORI—*Phosphorus Pill.*—*Take of phosphorus,* 2 *grains; balsam of tolu,* 120 *grains; yellow wax,* 60 *grains. Put the phosphorus and balsam of tolu into a Wedgewood mortar about half-full of hot water, and when the phosphorus has melted, and the balsam has become sufficiently soft, rub them together beneath the surface of the water until no particles of phosphorus are visible, the temperature of the water being maintained at or near* 140°. *Add now the wax, and as it softens mix it thoroughly with the other ingredients. Allow the mass to cool without being exposed to the air, and keep it in a bottle immersed in cold water. It may be softened with a few drops of rectified spirit when made into pills.*

*Dose.*—One thirty-second of a grain and upwards, but it is never given alone; of the oil, 5 to 10 min.; of the pill, 3 to 6 grains.

*Therapeutics.*—Phosphorus in over-doses acts as an irritant poison, causing inflammation of the stomach and bowels, and it is not an unfrequent cause of death, both designedly and accidentally. Many children have died after playing with, and licking the ends of lucifer matches; others have eaten it with fatal results when strewed as a poison for vermin, and it has been administered with the criminal intention of producing death. The poisonous effects of phosphorus do not follow immediately after it is taken, generally not until several hours have elapsed, and occasionally at the expiration of one or two days. The symptoms, which, when once manifested, run a rapid course, are those of an irritant poison: from the mouth to the stomach there is an acrid burning feeling, with increasing pain in the latter organ; there is intense thirst, nausea, vomiting, and purging; the abdomen becomes tympanitic; there is extreme depression, with a small fluttering pulse, cold clammy skin, and ultimately fatal collapse, occasionally preceded by jaundice and convulsions. The breath, vomited matters, and dejections of the patient have the odour of garlic, they emit white vapours, and in the dark are sometimes luminous. Death usually follows, after intense suffering, in a few days; the extreme periods are said to be four hours in the most rapid, and seventeen days in the most protracted case. One and a-half grains of phosphorus have caused death, and possibly less might prove fatal; but, on the other hand, many grains have been taken, and frequently repeated, with impunity. The post-mortem appearances are general fatty degeneration of the tissues or gastro-adenitis.

Workmen who are exposed to the fumes of phosphorus, as in lucifer-match making, are more or less affected by it, caries of the teeth proceeding to necrosis of the jaw being the usual course of the poisonous action in this way. The disease originates in an intense ostitis, which is most probably set up by the phosphoric acid dissolved in the saliva penetrating into the jaw through the cavities of the diseased teeth.

Medicinally, phosphorus acts as a stimulant to the nervous system, and requires extreme caution in its administration to avoid accidents. If given too freely, even in medicinal doses, it is apt to irritate the stomach, and at times to give rise to gastric ulcer. It appears to promote the nutrition of the brain and nervous system and bony skeleton, of which it is a component part, and is therefore of use in certain derangements of the nervous system, especially functional, as in nervous exhaustion, involving either the cerebral or spinal system, whether brought on by mental or bodily causes; also in chronic neuralgia, paraplegia, pemphigus, and in convalescence from illness when there is great debility. According to Dr. Wegner's experiments, it also promotes the growth of the bony tissue, hence its use in rickets, osteomalacia, in ununited fractures and subperiosteal excisions. In cases of poisoning give sulphate of copper, 3 grains, in dilute solution, every five minutes until vomiting is induced, as it forms a black phosphide of copper, insoluble and inert (Bamberger); then give sulphate or citrate of magnesia or quickly-acting purgatives; treat the symptoms as they arise, only avoid oil or fatty substances, as they dissolve the phosphorus and promote its absorption.

**Acidum Phosphoricum Dilutum**—Diluted Phosphoric Acid—(or tribasic) Phosphoric Acid—Phosphoric Acid ($H_3PO_4$) dissolved in water.

PREPARATION.—*Take of phosphorus,* 413 *grains; nitric acid,* 6 *fluid ounces; distilled water, a sufficiency. Put the nitric acid, diluted with* 8 *ounces of distilled water, into a tubulated retort connected with a Liebig's condenser, and, having added the phosphorus, apply a gentle heat so as slowly to distil five fluid ounces of liquid. Return this to the retort, and continue the distillation, occasionally returning the distillate, until the phosphorus has entirely disappeared. Transfer the contents of the retort to a porcelain dish of hard well-enamelled ware, and evaporate the liquid, until it is reduced to four fluid ounces, then, transferring it to a platinum vessel, continue the evaporation until it is reduced to about two fluid ounces, and orange-coloured vapours are no longer formed. Mix it now with distilled water, until, when cold, it measures one pint.*

*Characters.*—A colourless liquid, with a sour taste, and strongly acid reaction. With ammonio-nitrate of silver it gives a canary-yellow precipitate, soluble in ammonia, and in diluted nitric acid. Evaporated, it leaves a residue, which melts at a low red heat, and upon cooling exhibits a glassy appearance.

*Dose.*—Ten to twenty or thirty minims and upwards, sufficiently diluted with water.

*Therapeutics.*—In full doses, phosphoric acid acts as a stimulant, and as an irritant in poisonous doses, but, except by experiment upon animals, little is known of its poisonous effects. In medicinal doses it acts as a tonic, refrigerant, and as a resolvent of phosphatic deposits. Its effects resemble those of dilute sulphuric acid, but it is not so astringent. It has been recommended as a tonic in cases of general debility, atonic dyspepsia, &c., similar to those for which the other mineral acids are employed; in typhus and typhoid fevers; in colliquative sweating and diarrhœa; in scrofulous affections; in rachitis; in the phosphatic diathesis, and for the removal of phosphatic deposits, urinary and osseous; in scurvy; as a drink to allay thirst in diabetes, &c.

**Hypophosphorous Acid** ($HPH_2O_2$). It unites with bases to form hypophosphites. It is not employed medicinally, but enters into the constitntion of the

**Hypophosphites.** — CALCIS HYPOPHOSPHIS ($Ca2PH_2O_2$)—*Hypophosphite of Lime*—may be prepared by boiling four parts of milk of lime with one part of phosphorus until phosphoretted hydrogen ceases to be given off. It is carefully filtered, and excess of lime is precipitated by a stream of carbonic-acid gas. POTASSÆ HYPOPHOSPHIS ($KPH_2O_2$)—*Hypophosphite of Potash*—may be prepared by acting upon hypophosphite of lime with carbonate of potash, which mutually decompose each other, hypophosphite of potash being left in solution and carbonate of lime precipitated. The crystals are white and opaque; they are soluble both in water and in alcohol, and readly deliquesce on exposure to the atmosphere. SODÆ HYPOPHOSPHIS ($NAPH_2O_2$)—*Hypophosphite of Soda*—may be prepared by acting upon hypophosphite of lime with carbonate of soda, which mutually decompose each other, hypophosphite of soda being left in solution and carbonate of lime precipitated. The crystals have a pearly lustre, are of a rectangular tabular form, are soluble both in alcohol and in water, and are slightly deliquescent, but not so much so as the corresponding potash crystals; it is apt to explode during the evaporation of the solution. AMMONIÆ HYPOPHOSPHIS ($NH_4PH_2O_2$)—*Hypophosphite of Ammonia*—may be prepared by acting upon hypophosphite of lime with carbonate of ammonia. Like the corresponding potash salt, it is very deliquescent in air, and is readily soluble both in alcohol and water. FERRI HYPOPHOSPHITES: Of these there are two, namely, *ferric* hypophosphite, and *ferrous* hypophosphite, the former being a hypophosphite of the *peroxide*, the latter of the *protoxide* of iron. Besides the foregoing there are also hypophosphites of manganese, of quinine, &c.

*Doses of the Hypophosphites.*—From five to ten grains thrice daily; they may be given in combination with a vegetable tonic, or in the form of syrup. They may be given either separately, as in the simple syrups, or in combination, as in the compound syrups, which may contain several of the hypophosphites. The dose of the syrups is usually about a teaspoonful.

*Therapeutics.*—The hypophosphites are supposed to exercise all the beneficial effects of phosphorus without producing any of the untoward consequences of that elementary substance. They are called stimulants, tonics, alteratives, nervine stimulants. They were introduced by Dr. Churchill, and have been used chiefly in phthisis in all its stages, in general debility resulting from exhaustive discharges, in all cases in which the phosphates are deficient, in chorea, epilepsy, leucocythemia, anæmia, &c.; but it is extremely doubtful if they produce any of the effects of free phosphorus.

## CLASS II.—CERTAIN ACIDS WHICH MAY BE CONVENIENTLY CONSIDERED TOGETHER.

### GROUP I. SULPHURIC, HYDROCHLORIC, NITRIC, NITRO-HYDROCHLORIC, CARBONIC, HYDROSULPHURIC.

**ACIDUM SULPHURICUM** ($H_2SO_4$). Sulphuric Acid—Oil of Vitriol. An acid produced by the combustion of sulphur and the oxidation of the resulting sulphurous acid by nitrous fumes.

Sulphuric acid occurs as a natural product, but only to a limited extent; for commercial purposes it is prepared by admitting simultaneously into suitable leaden chambers sulphurous-acid gas, nitric-acid vapour, and steam. The sulphurous acid gets oxidised by the oxygen of the nitric acid, and the steam uniting with the anhydrous acid resulting, converts it into the ordinary acid $H_2SO_4$.

*Characters.*—A colourless liquid of oily appearance, intensely acid and corrosive. It evolves much heat on the addition of water, and when thus diluted gives a copious precipitate with chloride of barium.

It readily abstracts organic impurities, both during its preparation and on subsequent exposure, from the atmosphere, and is, therefore, seldom quite colourless, being usually of a pale straw or somewhat darker colour. It eagerly absorbs moisture from the atmosphere, and thereby rapidly increases in bulk; in consequence of this property of absorbing moisture, it chars most organic substances. The white precipitate with chloride of barium is insoluble in water, acids, and alkalies, and is a characteristic test for sulphuric acid and soluble sulphates.

ACIDUM SULPHURICUM AROMATICUM—*Aromatic Sulphuric Acid—Elixir of Vitriol.—Take of sulphuric acid,* 3 *fluid* *ounces, or 2419 grains by weight; rectified spirit, 2 pints; cinnamon bark, in coarse powder, 2 ounces; ginger, in coarse powder, 1½ ounce. Mix the sulphuric acid gradually with the spirit, add the cinnamon and ginger, macerate for seven days, agitating frequently. Then filter. Dose,* 5 *to* 30 *mins.*

ACIDUM SULPHURICUM DILUTUM—*Dilute Sulphuric Acid. —Take of sulphuric acid,* 7 *fluid ounces; distilled water, a sufficiency. Dilute the acid with* 77 *fluid ounces of the water, and when the mixture has cooled to* 60° *add more water, so that it shall measure* 83½ *fluid ounces. Or as follows:—Take of sulphuric acid,* 1350 *grains; distilled water, a sufficiency. Weigh the acid in a glass flask, the capacity of which to a mark on the neck is one pint. Then gradually add distilled water until the mixture, after it has been shaken and cooled to* 60°, *measures a pint. Dose,* 5 *to* 30 *mins.*

*Therapeutics.*—Sulphuric acid, in its concentrated state, acts as a powerful corrosive poison, eagerly combining with the organic bases and water of the tissues, corroding the mouth, gullet, and stomach, which are at first white, but ultimately are charred and black. When diluted, it acts, according to its strength, either as a corrosive, or simply as an irritant; or, if still more diluted, as an astringent, tonic, and refrigerant. The strong acid has been used as an escharotic. As a poison, sulphuric acid has frequently caused death, both accidentally and designedly. It has been swallowed by mistake for castor oil, in consequence of its oily appearance. One drachm has caused death in an adult; but as much as two ounces, or even more, have been taken, followed by recovery, the poisonous effects being greatest when the stomach is empty. The symptoms of poisoning begin the moment the acid touches the mouth and throat; they consist of intense burning pain in the *primæ viæ*, vomiting of dark-coloured matters, which are acid, contain shreds of disorganised tissues, and more or less of blood; breathing, speaking, and swallowing are performed with great pain and difficulty; the voice is husky, and the breath fetid; the abdomen is swollen and very tender; the skin is cold and clammy, the pulse, small, weak, and frequent; and ultimately fatal collapse ensues. The intellect being unimpaired, the patient feels his dreadful sufferings most keenly and anxiously. Death usually takes place within twenty-four hours, but it may be rapid and sudden, as by suffocation, if the air-passages are much implicated, or by perforation of the stomach; or, on the other hand, death may result from secondary causes several days, weeks, or months afterwards. Stricture of the œsophagus, chronic vomiting, or other secondary cause, may ultimately prove fatal. Antidotes, alkalies, and treat symptoms.

Diluted and aromatic sulphuric acids act as tonics, astringents, and refrigerants, and are employed in a variety of cases. They are given to check profuse perspiration, diarrhœa, and hæmorrhage. They are employed in the night-sweats of phthisis, in combination with opium in ordinary diarrhœa, in the diarrhœa which is premonitory of cholera, and in cholera itself; in passive hemorrhages from the stomach, bowels, lungs, and uterus; in leucorrhœa and other debilitating discharges; and as refrigerants in fevers. The diluted acids are also employed for the prevention and cure of saturnine poisoning; both internally and topically in certain skin diseases; in syphilis; in ptyalism; in certain calculous affections, with alkaline urine, &c. When long continued, these, like the other mineral acids, impair the digestive functions; they also injure the teeth, which should be protected, when the dose is taken, by making the patient sip the acid through a quill. Its disagreeably acid taste is best covered by sugar. Externally, the concentrated acid has been applied as a cauterant to the bites of rabid animals; to produce a cicatrix for the cure of entropion, &c.

**ACIDUM HYDROCHLORICUM.**—Hydrochloric Acid, HCl, dissolved in water—Muriatic Acid, Spirit of Salt.

*Preparation.*—Take of chloride of sodium, dried, 48 ounces; sulphuric acid, 44 fluid ounces; water, 36 fluid ounces; distilled water, 50 fluid ounces. Pour the sulphuric acid slowly into thirty-two ounces of the water, and when the mixture has cooled, add it to the chloride of sodium, previously introduced into a flask having the capacity of at least one gallon. Connect the flask by corks and a bent glass tube with a three-necked wash-bottle, furnished with a safety-tube, and containing the remaining four ounces of the water; then, applying heat to the flask, conduct the disengaged gas into a second bottle containing the distilled water, by means of a bent tube dipping about half-an-inch below the surface; and let the process be continued until the product measures sixty-six ounces, or the liquid has acquired a specific gravity of 1·16. The bottle containing the distilled water must be kept cool during the whole operation.

*Characters.*—A nearly colourless and strongly acid liquid, emitting white vapours having a pungent odour. It gives, with nitrate of silver, a curdy white precipitate, soluble in excess of ammonia, insoluble in nitric acid.

ACIDUM HYDROCHLORICUM DILUTUM—*Dilute Hydro-*

*chloric Acid.—Take of hydrochloric acid,* 8 *fluid ounces; distilled water, a sufficiency. Dilute the acid with* 16 *ounces of the water, then add more water, so that at a temperature of* 60° *it shall measure* 26½ *fluid ounces. Dose,* 10 *to* 30 *mins.*

Concentrated hydrochloric acid acts as a powerful corrosive poison, but poisoning by it is comparatively rare, the symptoms resemble those of poisoning by sulphuric acid, and their treatment is the same. It has been recommended as a topical application in cases of hospital gangrene, gangrenous stomatitis, scrofulous ulcers, and others of feeble vitality, aphthous, mercurial, and other ulcers of the mouth, tongue, and tonsils, diphtheria, malignant or putrid sore throat, warts, &c. In these cases it is applied either by means of a pointed piece of wood or a sponge, and of a strength varying with the circumstances. The diluted acid is administered internally as an alterative, tonic, and antalkaline, and has been used in cases of atonic dyspepsia, general debility, scrofula, phthisis, combined with a vegetable bitter in diseases of the liver, whether of scrofulous or specific origin, urinary affections with phosphatic deposits, diabetes, secondary syphilis, typhus and typhoid fevers, scarlatina, chronic hooping-cough, &c., and as a gargle in ulcerated sore throat.

**ACIDUM NITRICUM** ($2HNO_3 3H_2O$). Nitric Acid—Aqua Fortis.

An acid prepared from nitrate of potash or nitrate of soda by distillation with sulphuric acid and water, and containing 70 per cent. by weight of the nitric acid ($HNO_3$), corresponding to 60 per cent. of anhydrous nitric acid ($N_2O_5$). The reaction is $KNO_3 + H_2SO_4 = KHSO_4 + HNO_3$.

ACIDUM NITRICUM DILUTUM—*Diluted Nitric Acid.—Take of nitric acid,* 6 *fluid ounces; distilled water, a sufficiency. Dilute the acid with* 24 *fluid ounces of the water, then add more water, so that at a temperature of* 60° *it shall measure* 31 *fluid ounces. Dose,* 10 *to* 30 *mins.*

ACIDUM NITRO-HYDROCHLORICUM DILUTUM—*Diluted Nitro-Hydrochloric Acid.—Take of nitric acid,* 3 *fluid ounces; hydrochloric acid,* 4 *fluid ounces; distilled water,* 25 *fluid ounces. Mix the acids, and allow them to remain for twenty-four hours in a bottle, the mouth of which is partially closed; then add the water in successive portions, shaking the bottle after each addition, and preserve the mixture in a stoppered bottle. Dose,* 10 *to* 30 *mins.*

*Therapeutics.*—Concentrated nitric acid acts as a powerful corrosive poison, the symptoms of which and their treatment resemble those mentioned under sulphuric acid. The strong acid is used externally as a caustic application to phagedenic ulcers, hospital gangrene, poisoned wounds, the bites of rabid animals and poisonous vermin, condylomata, chancres, hæmorrhoids, warts, corns, carious bones, chilblains, &c. Internally, the diluted acid has been employed as an alterative, tonic, refrigerant, and antalkaline. It has been recommended in syphilitic cases in which mercury has either been previously given or is not desirable, and in rheumatic cases complicated with syphilis, under similar circumstances; in chronic affections of the liver and spleen; in diabetes; in atonic dyspepsia, especially with a vegetable bitter; in urinary affections with phosphatic deposits; in intermittent fevers; and also in typhus and typhoid fevers; in hooping-cough; in cholera, dysentery, and diarrhœa. It has been also injected into the bladder in cases of chronic inflammation, and for the solution of phosphatic calculi. In the form of liniment it has been used in some skin diseases and in alopœcia; and as a gargle in throat affections. It is also used as a fumigating and disinfecting agent. Its vapours, when incautiously inhaled, induce most intense capillary bronchitis. This has led to fatal results on several occasions.

*Nitro-hydrochloric acid* in the concentrated form (*Aqua Regia*) is not officinal, but it is occasionally used as a caustic. The diluted nitro-hydrochloric acid is employed, both internally and in the form of bath, as a tonic and alterative, and as a topical stimulant. It has been employed in chronic affections of the liver and spleen, in jaundice, and in dropsies proceeding from derangement of these organs, in which cases it is given internally, applied as a lotion to the region of the liver, as well as used as a pediluvium; in syphilis, both internally, externally, and as a gargle; in urinary affections, as in the phosphatic, oxalic acid, and cystic oxide diatheses; in gangrene of the lungs, as an antiseptic; in scarlatina, both internally and as a gargle; as a lotion in certain skin diseases, acne rosacea; in cholera; in epilepsy; in atonic dyspepsia; in chronic rheumatism; in indolent ulcers; in the scrofulous cachexia, &c.

**Acidum Carbonicum** ($CO_2$) — Carbonic Acid — Carbonic Anhydride—Choke-Damp—at the ordinary temperature of the atmosphere, is a colourless, transparent, inodorous, and sourish gas, but by pressure may be solidified. It is heavier than the atmosphere, its specific gravity being 1·525, and in some situations, as in the *Grotto del Cane*, near Naples, and in the Valley of Poisons, in Java, it is constantly present in such quantity as to cause the death of animals exposed to its influence; and but for the diffusive property of gases, this poisonous substance would gravitate to the surface of the earth and put an end to vitality. It has an acid reaction, is readily absorbed by solutions of potash and lime, and to a certain extent in water. The aqueous solution of carbonic acid is feebly and transiently acid. Under pressure, water may be made to absorb a considerable quantity, the excess of gas escaping forcibly on the removal of the pressure. Carbonic-acid gas may be obtained by decomposing any of the carbonates by means of a strong acid. Undiluted, it is irrespirable, producing spasmodic closure of the glottis and asphyxia; when diluted, it acts upon the brain, producing drowsiness, a feeling of fulness and tension in the head, throbbing headache, impaired vision, tinnitus aurium, giddiness, loss of muscular power, somnolency, stupor or coma, with lividity of countenance, general venous congestion, and sometimes delirium and convulsions. It often proves fatal in mines (Choke-Damp), brewers' vats, wells, caverns, &c. The indications of treatment are to aërate the blood by exposing the patient to free air, to produce respiratory effects by shocks of galvanism or cold affusion, or artifically if necessary, and to relieve congestion by moderate general or local bloodletting. Medicinally, carbonic-acid gas has been used as a general anæsthetic, and also as a local anæsthetic to afford relief from the pain occasioned by cancerous and other affections of the uterus, cancerous wounds, sciatica, and other neuralgic affections, dysentery, and diseases of the rectum, &c. By inhalation it has been used with great success in the treatment of spasmodic asthma, and of chronic bronchitis and emphysema. It has been used injected locally to produce premature labour. Internally, in the form of *aqua acidi carbonici*, soda water, potash water, acidulous mineral waters, &c., carbonic acid is given to subdue nausea and vomiting, to allay irritability of the stomach, to obviate the tendency to certain urinary deposits, &c. Effervescing drinks are suitable vehicles for the administration of many medicines which irritable stomachs will not bear when given in any other manner.

## **Acidum Hydrosulphuricum** ($H_2S$) — Hydro-Sulphuric Acid—Sulphuretted Hydrogen.

PREPARATION.—*Take of sulphuret of iron, ½ ounce; water, 4 fluid ounces; sulphuric acid of commerce, a sufficiency. Place the sulphuret of iron and the water in a glass bottle closed with a cork perforated by two holes, through one of which pass, air-tight, a funnel tube of sufficient length to dip into the water, and through the other a tube for giving exit* *to the gas. Through the former pour from time to time a little of the acid, so as to develop the sulphuretted hydrogen according as it is wanted.*

$FeS+H_2SO_4=H_2S+FeSO_4$. Sulphuretted hydrogen, at the ordinary temperature of the atmosphere, is a colourless gas, of a nauseous rotten-egg-like odour, inflammable, feebly and transiently reddening litmus paper, and soluble in water. The solution of sulphuretted-hydrogen gas in water is colourless, and emits an offensive rotten-egg-like odour. It is useful as a test, in consequence of its strong tendency to interchange with metallic oxides forming water and metallic sulphides—the latter of which, being in several instances insoluble in water, afford characteristic precipitates. Sulphuretted hydrogen is poisonous even when largely diluted with atmospheric air; it is produced in sewers, and by the putrefaction of animal tissues. Chlorine decomposes the gas, and therefore chloride of lime, or solutions of chlorine, may be used as antidotes. Sulphuretted hydrogen occurs also in the class of sulphurous mineral waters, previously mentioned.

### GROUP II.—ACETIC, TARTARIC, CITRIC, OXALIC, BORACIC.

## ACIDUM ACETICUM GLACIALE ($HC_2H_3O_2$)—Glacial Acetic Acid—Monohydrated Acetic Acid.

Concentrated acetic acid, corresponding to at least 84 per cent. of anhydrous acid, $C_4H_6O_3$.

Prepared by treating fused acetate of soda with sulphuric acid and distilling.

*Characters.*—It crystallizes when cooled to 34°, and remains crystalline until the temperature rises above 48°. Specific gravity, 1·063 to 1·065, and this is increased by adding 10 per cent. of water. At the mean temperature of the air it is a colourless liquid, with a pungent acetous odour.

The density of the liquid continues to increase on the addition of water, until the mixture consists of one equivalent of anhydrous acid to three equivalents of water. At this point of dilution the acid attains its maximum density (1·073), and on further dilution the specific gravity diminishes, so that when a sufficiency of water has been added, it again arrives at the density of 1·065—namely, that of the strong monohydrated acid. Therefore, the mere density would form no criterion of the strength of the acid; it is essential to know whether it increases or diminishes on the addition of water.

*Therapeutics.*—Glacial acetic acid acts as an irritant, rubefacient, vesicant, and escharotic. It is but seldom used even externally, and never internally, except in the form of aromatic vinegar, the stronger acetic acid being generally employed in its stead. It is sometimes used to destroy corns, warts, &c.; and, painted over the part, as a vesicant, in cases in which there is intolerance of cantharides. It is used in the preparation of the officinal ***Mistura Creasoti***, and ***Acetum Cantharides***; also in the preparation of aromatic vinegar.

**ACIDUM ACETICUM**—Acetic Acid—Purified Pyroligneous Acid. An acid liquid prepared from wood by destructive distillation, and subsequent purification; 100 parts by weight contain 33 parts of the acetic acid $HC_2H_3O_2$, corresponding to 28 parts of anhydrous acetic acid $C_4H_6O_3$.

Beech, oak, birch, and other hard and non-terebinthinous woods are employed in the preparation of acetic acid. They are first dried, and then heated in iron retorts. The products are partly gaseous, which are carried into the furnace to serve as fuel, and partly liquid, amongst which is impure acetic acid. In order to purify this, it is saturated either by soda or by chalk, whereby the acetate of soda or lime is formed. This salt is heated sufficiently to drive off the tarry matters which accompanied the acid, but carefully, so as not to decompose the salt itself. The acetate is next purified by repeated solution and crystallization, and finally, it is distilled with diluted sulphuric acid, which, by seizing upon the base to form sulphate of soda or lime, allows the acetic acid to pass over, and this is again purified by redistillation.

*Characters.*—A colourless liquid, having a strong acid reaction and a pungent odour.

ACIDUM ACETICUM DILUTUM—*Diluted Acetic Acid.—Take of acetic acid,* 1 *pint; distilled water,* 7 *pints; mix.*

OXYMEL—*Oxymel.—Take of clarified honey,* 40 *ounces; acetic acid,* 5 *fluid ounces; distilled water,* 5 *fluid ounces. Liquefy the honey by heat, and mix with it the acetic acid and water.*

*Dose.*—Of the diluted acid, one drachm or more, sufficiently diluted; of oxymel, one to three or four drachms, added to gargles or cough mixtures.

*Therapeutics.*—Strong acetic acid is occasionally used externally as a rubefacient, vesicant, and escharotic; to destroy morbid growths, venereal vegetations, warts, corns, &c.; to remove nævi; to produce vesication in cases in which there is intolerance of cantharides; as an application to tinea capitis, psoriasis, &c. It dissolves cantharidine, and enters into the officinal *Liquor Epispasticus.* Internally, the strong acid acts as a powerful corrosive poison, the symptoms and treatment resembling those of poisoning by the mineral acids. The diluted acid acts as a refrigerant and astringent, and may be used in the same manner as vinegar, both internally, and also externally either in form of lotion or for sponging the body in fevers and colliquative sweating. Oxymel is used as an adjunct to astringent gargles, and is given internally as an expectorant and diaphoretic. Dilute acetic acid is also employed for fumigation in the sick-room.

**ACETUM**—Vinegar, an acid liquid prepared from malt and unmalted grain by the acetous fermentation.

Vinegar may be obtained from a variety of substances, and varies in its quality according to its source. In this country it is prepared from malt, beer, cider, sugar dissolved in water, with the addition of a little brandy and yeast, and from other sources; but in France it is prepared from wines by simply exposing them freely to the influence of the atmosphere, adding a little vinegar to start the process. *Acetification,* as the process is termed, consists in the conversion of alcohol into aldehyd and water, and the former of these into hydrated acetic acid: thus, $C_2H_6O$ (alcohol), by the abstraction of two atoms of hydrogen, by the action of the oxygen of the atmosphere, becomes $C_2H_4O$ (aldehyd) $+H_2O$ (water), and the aldehyd, abstracting another equivalent of oxygen from the atmosphere, becomes hydrated acetic acid: $C_2H_4O+O=C_2H_4O_2$. The vinegar of commerce consists of this acetic acid diluted and contaminated with organic impurities.

*Characters.*—A liquid of a brown colour and peculiar odour.

*Dose.*—One to several drachms, either alone or diluted. As a drink, well diluted, *ad libitum.*

*Therapeutics.*—Its action and uses are identical with those of the dilute acetic acid.

**ACIDUM TARTARICUM** ($H_2C_4H_4O_6$)—Tartaric Acid. A crystalline acid prepared from the acid tartrate of potash.

*Preparation.*—Take of acid tartrate of potash, 45 ounces; distilled water, a sufficiency; prepared chalk, 12½ ounces; chloride of calcium, 13½ ounces; sulphuric acid, 13 fluid ounces. Boil the acid tartrate of potash with two gallons of the water, and add gradually the chalk, constantly stirring. When the effervescence has ceased, add the chloride of calcium dissolved in two pints of the water. When the tartrate of lime has subsided, pour off the liquid, and wash the tartrate with distilled water until it is rendered tasteless. Pour the sulphuric acid, first diluted with three pints of the water, on the tartrate of lime, mix thoroughly, boil for half-an-hour, with repeated stirring, and filter through calico. Evaporate the filtrate at a gentle heat until it acquires the specific gravity of 1·21, allow it to cool, and then separate and reject the crystals of sulphate of lime which have formed. Again evaporate the clear liquor till a film forms on its surface, and allow it to cool and crystallize. Lastly, purify the crystals by solution, filtration (if necessary), and recrystallization.

*Characters.*—In colourless crystals, the primary form of which is the oblique rhombic prism, it has a strongly acid taste, and is readily soluble in water and in rectified spirit. When to either solution, not too much diluted, a little acetate of potash is added, a white crystalline precipitate is formed. The crystals are inodorous and permanent in the atmosphere.

*Therapeutics.*—Tartaric acid in large doses acts as an irritant poison, and death has followed the administration of one ounce dissolved in half-a-pint of warm water. The symptoms and treatment resemble those of poisoning by oxalic acid. Medicinally, it is used as a refrigerant drink, well diluted with water, in febrile and inflammatory cases. It has been recommended as a solvent of mucus in the alimentary canal in certain cases of dyspepsia; but it is chiefly used to prepare effervescing draughts, for which it is cheaper but not so agreeable as citric acid. It enters into the constitution of *Seidlitz Powders.*

*Dose.*—Ten to twenty or thirty grains dissolved in water and sweetened. To prepare effervescing draughts, twenty grains of the crystallized acid will saturate twenty-seven grains of crystallized bicarbonate of potash, twenty-two grains of crystallized bicarbonate of soda, thirty-three and a-half grains of crystallised carbonate of soda, and fifteen and a-half grains of hydrated sesquicarbonate of ammonia.

**ACIDUM CITRICUM** ($H_3C_6H_5O_7H_2O$)—Citric Acid. A crystalline acid obtained from lemon juice, or from the juice of the fruit of *Citrus Limetta* (Risso), the Lime.

*Preparation.*—Take of lemon juice, 4 pints; prepared chalk, 4½ ounces; sulphuric acid, 2½ fluid ounces; distilled water, a sufficiency. Heat the lemon juice to its boiling point, and add the chalk by degrees till there is no more effervescence. Collect the deposit on a calico filter, and wash it with hot water till the filtered liquor passes from it colourless. Mix the deposit with a pint of distilled water, and gradually add the sulphuric acid, previously diluted with a pint and a-half of distilled water; boil gently for half-an-hour, keeping the mixture constantly stirred. Separate the acid solution by filtration, wash the insoluble matter with a little distilled water, and add the washings to the solution. Concentrate this solution to the density of 1·21, then allow it to cool, and, after twenty-four hours, decant the liquor from the crystals of sulphate of lime which will have formed; further concentrate the liquor till a film forms on its surface, and set it aside to cool and crystallize. Purify the crystals, if necessary, by recrystallization.

*Characters.*—In colourless crystals, of which the right rhombic prism is the primary form, very soluble in water, less soluble in rectified spirit, and insoluble in pure ether. The crystals dissolve in three-fourths of their weight of cold and in half their weight of boiling water. The diluted aqueous solution has an agreeable acid taste. When the solution is made by dissolving 34 grains of the acid in one ounce of water, it resembles lemon juice in its strength and in the nature of its acid properties, and, like lemon juice, it undergoes decomposition and becomes mouldy by keeping.

Citric acid is occasionally used as a substitute for fresh lemon juice, to which it is inferior as a refrigerant and antiscorbutic. But it is chiefly used in the preparation of effervescing draughts, and enters into the constitution of the officinal citrates.

*Dose.*—Ten to twenty or thirty grains dissolved in sufficient water and sweetened. To prepare effervescing draughts, seventeen grains (equal to half a fluid ounce of fresh lemon juice) will saturate twenty-five grains of bicarbonate of potash, twenty grains of bicarbonate of soda, twenty grains of carbonate of potash, thirty-five grains of carbonate of soda, fifteen grains of carbonate of ammonia, and thirteen grains of carbonate of magnesia.

## ACIDUM OXALICUM ($H_2C_2O_42H_2O$)—Oxalic Acid.

Oxalic acid crystallizes in transparent four-sided prisms, which are readily soluble in water and alcohol, are intensely sour, effloresce in dry air, fuse in their water of crystallization at 212°, and sublime, without leaving any residue, at 320°. Oxalic acid has been sold in mistake for sulphate of magnesia or *Epsom salts*, and for sulphate of zinc or *white vitriol*; but oxalic acid may be distinguished from the others by the following characters:—1. It is entirely volatilised by heat, if pure; the others are fixed, after parting with their water of crystallization. 2. Oxalic acid is intensely sour; sulphate of zinc much less so, and sulphate of magnesia neutral and bitter. 3. Nitrate of silver precipitates white oxalate of silver, which is soluble in cold nitric acid. 4. With solution of sulphate of lime, oxalic acid gives a white precipitate, which is soluble in nitric acid, but insoluble in the vegetable acids. 5. By evaporating a solution containing oxalic acid, the crystals bearing their distinguishing characters may be obtained.

*Dose.*—Half-a-grain to one or two grains dissolved in water and sweetened. As a drink, five grains, dissolved in half-a-pint of water, sweetened, may be given in the twenty-four hours; or in the form of lemonade.

*Therapeutics.*—Oxalic acid in over-doses acts as a virulent poison, occasioning death sometimes within a few minutes, frequently within an hour, but occasionally after a longer interval, according to the quantity taken, the amount of fluid taken with it, and the state of the stomach at the time with regard to food. Death has followed the administration of a drachm of the acid, and recoveries have taken place after half-an-ounce has been swallowed. The symptoms immediately following the administration of a large dose are—an intensely sour taste, a burning sensation in the œsophagus and stomach, a choking or suffocating feeling of constriction in the throat, and great tenderness of the abdomen; this is usually, but not invariably, followed by vomiting of dark-greenish or brownish-coloured matters, mixed with blood, and very acid. The skin is cold and clammy; the pulse small, weak, and frequent; the countenance anxious and expressive of great pain; and ultimately, fatal collapse ensues, occasionally preceded by convulsions. If the patient recover from the immediate consequences, he may subsequently suffer from great pain in the *primæ viæ*, difficulty of swallowing, intense thirst, vomiting, &c. Medicinally, oxalic acid has been recommended as a refrigerant, sedative, and antiphlogistic, and has been given in acute inflammatory affections of the mucous membranes, especially of the stomach and respiratory organs; it has been given, also, as a refrigerant drink in febrile. Antidotes—chalk, magnesia or lime water: the alkalies, and their carbonates form poisonous salts with oxalic acid, and are therefore inadmissible.

## ACIDUM BORACICUM ($H_3BO_3$)—Boracic Acid.

Boracic acid is prepared by the action of hydrochloric or sulphuric acid upon borax (biborate of soda). Hydrochloric acid is preferable.

Boracic acid occurs in white scaly crystals of a pearly lustre, which are inodorous, of a slightly acid and bitter taste; are soluble in hot water and alcohol, less soluble in cold water, the solutions having a feebly acid reaction. The crystals are unctuous to the touch, and are fused by a red heat into a colourless transparent glass. The alcoholic solution burns with a green flame. It is introduced into the Appendix of the Pharmacopœia as a test for the purity of rhubarb. It renders cream of tartar more soluble when added to it. It enters into the constitution of borax.

*Therapeutics.*—It was formerly employed as a sedative in cerebral affections, in cardialgia, &c., but has now almost disappeared from medical practice. It has, however, lately come into pretty general use in surgery as an antiseptic dressing for wounds. It acts as an excellent slightly stimulating antiseptic, whereas carbolic acid is a strongly stimulating one. It is employed—1st, in the form of a saturated aqueous solution, in which the lint employed to dress the wound is steeped; 2nd, as an ointment, composed of one part of the powdered crystals to three parts of simple ointment; and 3rd, to prepare a dry dressing formed of lint which has been immersed in a hot saturated solution of the acid and then dried.

## CLASS III.—METALS.

### GROUP I. METALS OF THE ALKALIES—POTASSIUM, SODIUM, and LITHIUM, with which it is convenient to place AMMONIA.

**POTASSIUM** ($K=39$)—Potassium—Kalium—is a bluish-white brittle metal, floats on water, and readily oxidises when exposed to the air. It is abundantly distributed throughout nature in combination with the acids, earths, and halogens. It is the metallic base of

**Potassa Caustica** ($KHO$)—Potassæ Hydras—Potassa Fusa—Oxide of Potassium—Hydrate of Potash.

PREPARATION.—*Take a solution of potash, 2 pints. Boil down the solution of potash rapidly in a silver or clean iron vessel until there remains a fluid of oily consistence, a drop of which, when removed on a warm glass rod, solidifies on cooling. Pour this into proper moulds, and when it has solidified, and while it is still warm, put it into stoppered bottles.*

*Characters.*—In hard white pencils, very deliquescent, powerfully alkaline and corrosive. A watery solution acidulated by nitric acid gives a yellow precipitate with perchloride of platinum, and only scanty white precipitates with nitrate of silver, and chloride of barium.

*Therapeutics.*—Caustic potash is a powerful escharotic and corrosive irritant poison. The symptoms of poisoning consist of the disagreeable acrid and caustic taste of the potash; burning pain in the mouth, throat, œsophagus, and stomach; generally vomiting of dark-brown coloured matters, which are alkaline, and contain blood and shreds of mucous membrane; great tenderness of the abdomen, with colicky pains and purging; skin cold and clammy; pulse small, weak, and frequent; hiccough, &c. The mouth and fauces are tense, red, and corroded. Sometimes the larynx is implicated, and death is caused by asphyxia. Death may take place by collapse within a few hours or days of the poisoning, or subsequently by exhaustion. Antidotes, dilute acids and demulcents. Medicinally, caustic potash is used only externally as an escharotic to form issues, to destroy morbid growths, to remove nævi, to obliterate varicose veins, to arrest hospital gangrene, to open deep-seated and chronic abscesses and bubos, to overcome strictures of the urethra, to destroy hypertrophied and ulcerated portions of the os and cervix uteri, &c.

The chief hindrance to the application of caustic potash is its deliquescence; but its action may be limited by protecting the surrounding parts with cotton wadding soaked in vinegar. To obviate this, it has been prepared in a variety of ways: *Potassa cum calce* consists of equal parts of lime and caustic potash; it is less energetic than the pure caustic, but is also less troublesome to use. *Vienna Paste* is a modification of the above, made by powdering together potassa cum calce and quicklime in the proportions of five of the former to six of the latter; the powder is made into a paste with spirit when required.

**Liquor Potassæ**—Solution of Potash—Caustic Potash dissolved in water.

PREPARATION.—*Take of carbonate of potash,* 1 *pound; slaked lime,* 12 *ounces; distilled water,* 1 *gallon. Dissolve the carbonate of potash in the water; and having heated the solution to the boiling-point in a clean iron vessel, gradually mix with it the slaked lime; and continue the ebullition for ten minutes, with constant stirring. Then remove the vessel from the fire; and when, by the subsidence of the insoluble matter, the supernatant liquor has become perfectly clear, transfer it by means of a siphon to a green-glass bottle furnished with an air-tight stopper, and add distilled water, if necessary, to make it correspond with the tests of specific gravity and neutralising power.*

*Dose.*—Ten minims up to one or two drachms, largely diluted in aromatic or bitter infusions, milk, mistura amygdalæ, &c.

*Therapeutics.*—Concentrated liquor potassæ acts as a corrosive irritant poison, the symptoms and treatment resembling those of poisoning by caustic potash. Medicinally, liquor potassæ is used as an antacid, antilithic, lithontriptic, alterative, diuretic, liquefacient, resolvent, &c. It has been recommended in scrofula; in syphilis; in acute and chronic rheumatism; in dyspepsia, accompanied by acidity, cardialgia, &c.; in a variety of skin diseases; in serous inflammations; in chronic bronchitis and catarrh; in obesity; in certain calculous affections and irritable conditions of the urinary organs; in gonorrhœa and in strangury, &c. Externally, well diluted, it is employed as a lotion in chronic skin diseases, and occasionally as an escharotic, applied in the concentrated form to the bites of rabid and poisonous animals, &c.

**Potassæ Carbonas** ($K_2CO_3$, with about 16 per cent. of water of crystallization). Carbonate of Potash. It is made by lixiviating and purifying the pearl ashes of commerce.

*Characters.*—A white crystalline powder, alkaline and caustic to the taste, very deliquescent, readily soluble in water, but insoluble in spirit, effervescing with diluted hydrochloric acid, and forming a solution with which perchloride of platinum gives a yellow precipitate.

*Dose.*—Five or ten to twenty grains, sufficiently diluted; as a lotion, half-a-drachm to a drachm in a pint of water; as a bath, one to three ounces in twenty to thirty gallons of water; as an ointment, half-a-drachm to an ounce of simple ointment.

*Therapeutics.*—Carbonate of potash in over-doses acts as a corrosive poison, the symptoms and treatment resembling those of poisoning by caustic potash. Medicinally, it is an antacid, diuretic, alterative, and antilithic. It is less caustic than potash, and may therefore be administered more freely; but in consequence of its disagreeable taste and irritant action, it is comparatively little used. It has been employed in cases similar to those for which the bicarbonate and solution of potash are recommended, and occasionally in the form of effervescing draughts. It passes into the urine unchanged. Externally, in the form of lotion, bath, or ointment, it has been used in skin diseases, more especially in the various forms of eczema.

**Potassæ Bicarbonas** ($KHCO_3$). Bicarbonate of Potash.

PREPARATION.—*Take of carbonate of potash,* 1 *pound; distilled water,* 2 *pints; hydrochloric acid,* 1½ *pint; water,* 3 *pints; white marble, in fragments,* 1 *pound, or a sufficiency. Dissolve the carbonate* *of potash in the distilled water, and filter the solution into a three-pint bottle, capable of being tightly closed by a cork traversed by a glass tube, sufficiently long to pass to the bottom of the fluid. Introduce the marble into another bottle, in the bottom of which a few small holes have been drilled, and the mouth of which is closed by a cork, also traversed by a glass tube, and place the bottle in a jar of the same height as itself, but of rather larger diameter. Connect the two glass tubes, air-tight, by a caoutchouc tube. The cork of the bottle containing the carbonate of potash having been placed loosely, and that of the bottle containing the marble tightly, in its mouth, pour into the jar surrounding the latter bottle the hydrochloric acid previously diluted with the water. When carbonic-acid gas has passed through the potash solution for two minutes, so as to expel the whole of the air of the apparatus, fix the cork tightly in the neck of the bottle, and let the process go on for a week. At the end of this time numerous crystals of bicarbonate of potash will have formed which are to be removed, shaken with twice their bulk of cold distilled water, and, after decantation of the water, drained, and dried on filtering paper by exposure to the air. The mother-liquor, filtered if necessary, and concentrated to one-half, at a temperature not exceeding* 110°, *will yield more crystals.*

*The tube immersed in the solution of carbonate of potash, which should have as large a diameter as possible, may require the occasional removal of the crystals formed within it, in order that the process may not be interrupted.*

*Characters.*—Colourless right rhombic prisms, not deliquescent, of a saline feebly alkaline taste, not corrosive. Diluted hydrochloric acid causes strong effervescence, forming a solution with which perchloride of platinum gives a yellow precipitate.

*Dose.*—Ten grains to half-a-drachm, sufficiently diluted ; or in the form of effervescing draughts, in proportion of twenty grains of the bicarbonate to fourteen grains of citric acid, or three fluid drachms and a-half of fresh lemon juice.

*Therapeutics.*—Bicarbonate of potash acts as an antacid, diuretic, alterative, and antilithic ; it has none of the corrosive properties of potash and its carbonate. It is employed in dyspepsia with acidity of the stomach, cardialgia, most usually in combination with a bitter tonic infusion, as infusion of gentian, &c. Largely diluted, it is employed in the lithic acid cachexia to maintain uric acid in solution, also to allay irritability of the bladder and kidneys, and in such cases is commonly combined with pareira, bucchu, or uva ursi, in the alkaline treatment of acute and chronic rheumatism, and in cases similar to those for which potash and its carbonate are recommended. The bicarbonate and carbonate of potash and soda are found more suitable than the solutions of the caustic alkalies for prescribing along with vegetable solutions, as the latter are apt to be decomposed by continued contact with caustic alkali, while they may be kept for any length of time unaffected by the carbonates.

**Liquor Potassæ Effervescens**—Effervescing Solution of Potash—Potash Water.

PREPARATION.—*Take of bicarbonate of potash,* 30 *grains; water,* 1 *pint. Dissolve the bicarbonate of potash in the water, and filter the solution; then pass into it as much pure washed carbonic-acid gas, obtained by the action of sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.*

*Characters.*—Effervesces strongly when the containing vessel is opened, carbonic-acid gas escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste.

The actions and uses of this preparation are the same as those of the bicarbonate. It is, however, a valuable addition to the Pharmacopœia, inasmuch as it affords a fixed standard strength for effervescing solutions of potash, which vary much as obtained from different manufacturers.

**Potassæ Sulphas** ($K_2SO_4$).—Sulphate of Potash.

*Characters and Tests.*—In colourless hard six-sided prisms, terminated by six-sided pyramids; decrepitates strongly when heated; sparingly soluble in water; insoluble in alcohol. The aqueous solution is neutral to test paper, gives no precipitate with oxalate of ammonia, but, acidulated with hydrochloric acid, it is precipitated white by chloride of barium, and yellow by perchloride of platinum.

*Dose.*—Fifteen to fifty or sixty grains, or more, either dissolved in a considerable quantity of water, or as a combination with rhubarb, or with rhubarb and aloes in solution.

*Therapeutics.*—In large doses sulphate of potash may act as an irritant poison, and has caused death in several instances. In France it has been used to procure abortion. Medicinally, it is used as a mild aperient in dyspeptic and hepatic cases; it is also employed to repress the secretion of milk after parturition. It enters into ***Pulvis Ipecacuanhæ Compositus,*** of which it forms eight parts in ten by weight. It is introduced simply for its property of aiding the pulverisation of the ipecacuanha.

**Potassæ Nitras** ($KNO_3$)—Nitrate of Potash—Saltpetre—Nitre.

The nitrate of potash of commerce, purified, if necessary, by crystallization from solution in distilled water. The nitre or saltpetre of commerce is chiefly derived from certain districts in the East Indies. It is a natural production, and is met with either as an efflorescence upon the surface of the soil, or disseminated through its superficial stratum. It is separated by lixiviating the soil.

*Characters.*—In white crystalline masses or fragments of striated six-sided prisms, colourless, of a peculiar cool saline taste. Thrown on the fire, it deflagrates; warmed in a test-tube with sulphuric acid and copper wire, it evolves ruddy fumes. Its solution acidulated with hydrochloric acid gives a yellow precipitate with perchloride of platinum.

*Dose.*—Five to twenty grains and upwards. In the smaller doses of five or ten grains, it may be given either in the form of powder or made into a draught with water and syrup; in the larger doses of several drachms to an ounce or more in twenty-four hours, it is given largely diluted in barley-water or other beverage, as a drink; or in the form of nitre-whey.

*Therapeutics.*—Nitrate of potash in large doses acts as an irritant poison, causing pain in the stomach and abdomen, with nausea, vomiting, and purging, followed by collapse; a feeling of cold referred to the spine, muscular tremors, convulsions, &c., have been observed. Medicinally, in the smaller doses, it acts as a refrigerant, diuretic, and diaphoretic, its effects being modified by the tendencies of the medicines with which it is combined, and the mode of its administration. As a refrigerant it is most active when dissolved in a little water immediately before it is taken. It has been recommended in continued fevers and in inflammatory affections, with the object of subduing the preternatural heat and reducing the force of the circulation, according to those who consider it to be a sedative of the heart and vascular system as well as a refrigerant. As a diuretic, it is sometimes given in dropsies. In spasmodic asthma the fumes of nitrate of potash (arising from burning paper previously saturated with a solution of the salt, and dried) sometimes give relief. In acute rheumatism, nitrate of potash is given in large doses, in some cases from an ounce to an ounce and a-half in the twenty-four hours. As a gargle, it is occasionally used in incipient sore throat; and externally, in combination with sal-ammoniac, it is used as a refrigerant lotion.

## **Potassæ Acetas** ($KC_2H_3O_2$)—Acetate of Potash.

PREPARATION.—*Take of carbonate of potash, 20 ounces; acetic acid, 2 pints, or a sufficiency. To the acetic acid, placed in a thin porcelain basin, add gradually the carbonate of potash, filter, acidulate, if necessary, with a few additional drops of the acid, and, having evaporated to dryness, raise the heat cautiously, so as to liquefy the product. Allow the basin to cool, and when the salt has solidified, and while it is still warm, break it into fragments and put it into stoppered bottles.*

*Characters.*—White foliaceous satiny masses, very deliquescent, with a watery solution of which tartaric acid causes a crystalline precipitate, sulphuric acid the disengagement of acetic acid, and a dilute solution of perchloride of iron strikes a deep-red colour.

*Dose.*—Ten to thirty grains as a diuretic, sufficiently diluted; in larger doses it acts as a cathartic, but is seldom used for that purpose.

*Therapeutics.*—Acetate of potash in moderate doses acts as a diuretic, and being converted into the carbonate whilst in the system, it renders the urine alkaline as well as more copious. It is chiefly used as a diuretic in dropsies; also in the alkaline treatment of acute rheumatism, in certain skin diseases, and in the uric acid diathesis.

## **Potassæ Chloras** ($KClO_3$)—Chlorate of Potash.

PREPARATION.—*Take of carbonate of potash, 20 ounces; slaked lime, 53 ounces; distilled water, a sufficiency; black oxide of manganese, 80 ounces; hydrochloric acid, 24 pints. Mix the lime with the carbonate of potash, and triturate them with a few ounces of the water, so as to make the mixture slightly moist. Place the oxide of manganese in a large retort or flask, and having poured upon it the hydrochloric acid, diluted with six pints of water, apply a gentle sand heat, and conduct the chlorine, as it comes over, first through a bottle containing six ounces of water, and then into a large carboy containing the mixture of carbonate of potash and slaked lime. When the whole of the chlorine has come over, remove the contents of the carboy, and boil them for twenty minutes with seven pints of the water; filter and evaporate till a film forms on the surface, and set aside to cool and crystallize. The crystals thus obtained are to be purified by dissolving them in three times their weight of boiling distilled water, and again allowing the solution to crystallize.*

*Characters.*—In colourless rhomboidal crystalline plates, with a cool saline taste, sparingly soluble in cold water. It explodes when triturated with sulphur. By heat it fuses, gives off oxygen gas, and leaves a white residue readily forming with water, a neutral solution, which is precipitated white by nitrate of silver, and yellow by perchloride of platinum.

*Dose.*—Ten to thirty grains or more dissolved in water. For children, two to five grains in solution.

TROCHISCI POTASSÆ CHLORATIS—Chlorate of Potash Lozenges.

PREPARATION.—*Take of chlorate of potash, in powder,* 3600 *grains; refined sugar, in powder,* 25 *ounces; gum acacia, in powder,* 1 *ounce; mucilage of gum acacia,* 2 *fluid ounces; distilled water,* 1 *fluid ounce, or a sufficiency. Mix the powders, and add the mucilage and water to form a proper mass. Divide into* 720 *lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains five grains of chlorate of potash.*

*Dose.*—One to six lozenges.

*Therapeutics.*—Chlorate of potash acts locally as a stimulant. It has been supposed capable of supplying oxygen to the system, and also the deficiency of the saline constituents of the blood in cholera and other diseases; but it does not do so, as it is eliminated by the urine unchanged, and in all probability its action is purely local, hence it is principally used as a gargle. In cancrum oris, gangrenous stomatitis, aphthous and other ulcerations of the mouth, in diphtheria, cynanche, fetid breath, in scarlatina, &c. As a lotion it is applied to a variety of painful and indolent ulcers, and as an injection in affections of the genito-urinary organs. The lozenges are specially applicable for throat affections.

**Potassæ Tartras Acida** ($KHC_4H_4O_6$)—Acid Tartrate of Potash—Potassæ Bitartras—Cream of Tartar.

An acid salt which is obtained from the crude tartar which is deposited during the fermentation of grape-juice.

Acid tartrate of potash, in an impure state, is obtained as a deposit from wine. It occurs in the juice of the fresh grape in a soluble form, but when the juice has undergone the vinous fermentation, its sugar being converted into alcohol, the salt is no longer soluble, and is deposited as "red argol" from red wines, and as "white argol" from white wines. In this state of crude tartar or argol it is met with in wine casks. It is purified by dissolving it in water with a small proportion of pipe-clay, leaving the pure tartrate to crystallize upon the surface of the liquor and the sides of the vessel.

*Characters.*—A gritty white powder, or fragments of cakes crystallized on one surface; of a pleasant acid taste, sparingly soluble in water, insoluble in spirit. Heated in a crucible, it evolves inflammable gas and the odour of burned sugar, and leaves a black residue. This effervesces with diluted hydrochloric acid, and forms a solution which, when filtered, gives a yellow precipitate with perchloride of platinum, and when neutralised by ammonia is rendered slightly turbid by oxalic acid.

*Dose.*—Ten to sixty grains as a refrigerant and diuretic, and up to half-an-ounce as a cathartic, dissolved, or in the form of confection, or as a drink.

*Therapeutics.*—Acid tartrate of potash in over-doses acts as an irritant poison; in the smaller doses it acts as a refrigerant and diuretic, and in the larger doses as a mild aperient, or as a hyragogue cathartic according to the quantity, acting more energetically when only partially dissolved or given in the form of confection. It is found in the urine in the form of carbonate, and renders it alkaline. It is given in fever and inflammatory diseases, in dropsical affections, in chronic affections of the liver; in combination with sulphur, as in the confection, it is given in hæmorrhoids, chronic dysentery, and diseases of the rectum; albuminuria, chronic cardiac diseases, &c. It is a constituent of sulphur confection and of compound powder of jalap.

### **Potassæ Tartras** ($K_2C_4H_4O_6$)—Tartrate of Potash.

PREPARATION.—*Take of acid tartrate of potash, 20 ounces, or a sufficiency; carbonate of potash, 9 ounces, or a sufficiency; boiling distilled water, 2½ pints. Dissolve the carbonate of potash in the water; add by degrees the acid tartrate of potash, and if, after a few minutes' boiling, the liquid is not neutral to test paper, make it so by the careful addition of more of the carbonate or of the acid tartrate. Then filter, concentrate till a pellicle forms on the surface, and set it aside to cool and crystallize. More crystals may be obtained by evaporating and cooling the mother-liquor. Drain the crystals, dry them by exposure to the air in a warm place, and preserve them in a stoppered bottle.*

*Characters.*—In small colourless four or six-sided prisms. Heated with sulphuric acid it forms a black tarry fluid, evolving inflammable gas and the odour of burned sugar. Acetic acid added sparingly to its solution causes the separation of a white crystalline precipitate.

*Dose.*—As a diuretic, twenty to sixty grains; as a cathartic, in doses up to half-an-ounce, or more, dissolved in water or other vehicle, as infusion of senna, rhubarb, &c.

*Therapeutics.*—Tartrate of potash in small doses acts as a diuretic, and being converted into the carbonate in the system, tends to render the urine alkaline. In larger doses it is employed as a mild saline cathartic.

**Potassæ Citras** ($K_3C_6H_5O_7$)—Citrate of Potash.

PREPARATION.—*Take of carbonate of potash, 8 ounces, or a sufficiency; citric acid, in crystals, 6 ounces, or a sufficiency; distilled water, 2 pints. Dissolve the citric acid in the water, and the carbonate of potash gradually, and if the solution be not neutral, make it so by the cautious addition of the acid or the carbonate of potash. Then filter, and evaporate to dryness, stirring constantly, after a pellicle has begun to form, till the salt granulates. Triturate in a dry warm mortar and preserve the powder in stoppered bottles.*

*Characters.*—A white powder of saline feebly-acid taste, deliquescent, and very soluble in water. Heated with sulphuric acid it forms a brown fluid, gives off an inflammable gas, and evolves the odour of acetic acid. Its solution, mixed with a solution of chloride of calcium, remains clear till it is boiled, when a white precipitate separates, readily soluble in acetic acid. Its solution, acidulated with hydrochloric acid, gives a yellow precipitate with perchloride of platinum.

*Dose.*—Ten to thirty grains or more dissolved in water and sweetened.

*Therapeutics.*—Citrate of potash acts as a diaphoretic, diuretic, and refrigerant; it does not affect the bowels so readily as the other neutral salts of potash.

It is converted into the carbonate in the system, and tends to render the urine alkaline. It is employed in febrile and inflammatory diseases, in cases of irritability of the stomach, in uric acid gravel, in gout and rheumatism, in scurvy, &c.

POTASSÆ BICHROMAS ($K_2Cr_2O_7$).—Bichromate of potash may be prepared by adding sulphuric acid to a solution of chromate of potash, and setting aside the mixture until the crystals are deposited.

*Characters.*—In large red transparent four-sided tables; anhydrous; fuses below redness; at a higher temperature is decomposed, yielding green oxide of chromium and yellow chromate of potash, which may be separated by dissolving the latter in water.

*Therapeutics.*—This salt is used in the preparation of Valerianate of Soda, but is not much employed in medicine. In over-doses it acts as a powerful irritant poison. In doses of a tenth to a fifth of a grain it is used as an alterative in secondary syphilis; in larger doses of one or two grains it acts as an emetic, but is unsafe in consequence of its irritant properties. Externally, it is used as a caustic, either in the solid form or as a concentrated solution. Solutions of the bichromate act as antiseptics. Workmen employed in the manufacture of bichromate of potash are apt to suffer from painful ulcerations of the hands.

**SODIUM** ($Na=23$)—*Sodium—Natrium*—is a soft, malleable, wax-like, and somewhat silver-like metal, which burns with a yellow flame, floats on water, and readily tarnishes by oxidation when exposed to the air. It exists largely throughout nature in the form of common *salt* ($NaCl$), and is the metallic base of the soda compounds.

## Soda Caustica ($NaHO$)—Sodæ Hydras.

PREPARATION.—*Take of solution of soda, 2 pints. Boil down the solution of soda rapidly in a silver or clean iron vessel, until there remains a fluid of oily consistence, a drop of which, when removed on a warm glass rod, solidifies on cooling. Pour the fluid on a clean silver or iron plate, or into moulds, and as soon as it has solidified break it in pieces, and preserve it in stoppered green-glass bottles.*

*Characters.*—Hard and greyish-white, very alkaline and corrosive. It imparts a yellow colour to flame, and its solution in water, acidulated by nitric acid, gives only scanty white precipitates with nitrate of silver and chloride of barium.

*Antidotes, doses, actions, and uses* same as caustic potash, than which it is less powerful and less deliquescent, but it is chiefly used for chemical purposes.

## Liquor Sodæ—Solution of Soda.

PREPARATION.—*Take of carbonate of soda, 28 ounces; slaked lime, 12 ounces; distilled water, 1 gallon. Dissolve the carbonate of soda in the water; and, having heated the solution to the boiling point in a clean iron vessel, gradually mix with it the slaked lime, and continue the ebullition for ten minutes with constant stirring. Then remove the vessel from the fire; and when, by the subsidence of the insoluble matter the supernatant liquor has become perfectly clear, transfer it by means of a siphon to a green-glass bottle furnished with an air-tight stopper, and add distilled water, if necessary, to make it correspond with the tests of specific gravity and neutralising power.*

*Antidotes, doses, actions, and uses* similar to those of liquor potassæ, than which it is somewhat weaker. It is employed in the preparation of caustic soda, valerianate of soda, and sulphurated antimony.

## Sodæ Carbonas ($Na_2CO_3,10H_2O$)—Carbonate of Soda.

Obtained from the ashes of marine plants, or produced by chemical decomposition, with chloride of sodium.

Carbonate of soda was formerly derived chiefly from barilla and kelp, the former being the ashes of *salsola soda*, and other maritime plants, the latter being the ashes of sea-weeds; but it is now commonly obtained from Sea Salt. The chloride of sodium is first converted into *salt-cake*, which consists of sulphate of soda; and this being heated with crushed chalk and small coal, is converted into what is termed *ball soda* or *black-ash*, from which the carbonate is derived by lixiviation and subsequent purification.

*Characters.*—In transparent colourless laminar crystals of a rhombic shape, efflorescent, with a harsh alkaline taste and strong alkaline reaction. It imparts a yellow colour to flame, and dissolves with effervescence in diluted hydrochloric acid, forming a solution which does not precipitate with perchloride of platinum. By heat it undergoes aqueous fusion, and then dries up, losing sixty-three per cent. of its weight.

SODÆ CARBONAS EXSICCATA — DRIED CARBONATE OF SODA.—*Take of carbonate of soda*, 8 *ounces. Expose the carbonate of soda in a porcelain capsule to a rather strong sand heat until the liquid which first forms is converted into a dry cake; and, having rubbed this to powder, enclose it in a stoppered bottle.*

*Antidotes, doses, actions, and uses* same as carbonate of potash, except it is not so caustic, or tends to impoverish the blood if given for some time like the corresponding preparation of potash, neither is it so powerful a solvent of uric acid as potash. By some physicians, however, soda, and especially its carbonate, is believed to exert a specially beneficial alterative effect on mucous membranes, and on that account is prescribed in preference to potash in diseases involving those structures. Dried carbonate of soda is simply the previous carbonate, minus its water of crystallization, so that fifty-three grains of the dried are equal to 143 grains of the common carbonate. It may be given in doses of five to fifteen grains in pill or powder.

## Sodæ Bicarbonas ($NaHCO_3$)—Bicarbonate of Soda.

PREPARATION.—*Take of carbonate of soda*, 2 *pounds; dried carbonate of soda*, 3 *pounds; white marble, in fragments*, 4 *pounds; hydrochloric acid*, 1 *gallon; water*, 2 *gallons; distilled water, a sufficiency. Fill with the marble a tubulated glass bottle having a few small holes drilled in the bottom, connect the tubulure tightly by a bent tube and corks with an empty two-necked bottle, and connect this with another bottle filled with the carbonates of soda, well triturated together, and let the tube be long enough to reach the bottom of the bottle. Before fixing the cork in the bottle containing the carbonate of soda, partially immerse the bottle containing the marble in the hydrochloric acid previously diluted with* *the water, and placed in any convenient vessel. When the whole apparatus is filled with carbonic-acid gas, fix in tightly the cork of the bottle containing the carbonate of soda, and let the action go on until the gas ceases to be absorbed. Pour upon the damp salt which is formed half its weight of cold distilled water, and shake it occasionally during the course of half-an-hour, then drain the undissolved portion, and dry it by exposure to the air on filtering paper placed on porous bricks.*

*Characters.*—In powder or small opaque irregular scales, white, of a saline not unpleasant taste. Imparts a yellow colour to flame. Dissolves with much effervescence in diluted hydrochloric acid, forming a solution in which perchloride of platinum causes no precipitate. A solution of the salt in cold water, gives a white and not a coloured precipitate with solution of perchloride of mercury.

*Dose.*—Ten grains to half-a-drachm, sufficiently diluted; or in the form of effervescing draughts in the proportion of twenty grains of the bicarbonate to eighteen grains of tartaric acid, seventeen grains of citric acid, or half-an-ounce of lemon juice. Externally, as a lotion or ointment.

**Trochisci Sodæ Bicarbonatis**—Bicarbonate of Soda Lozenges.

PREPARATION.—*Take of bicarbonate of soda, in powder, 3600 grains; refined sugar, in powder, 25 ounces; gum acacia, in powder, 1 ounce; mucilage of gum acacia, 2 fluid ounces; distilled water, 1 fluid ounce. Mix the powders, and add the mucilage and water to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains 5 grains of bicarbonate of soda.*

*Dose.*—One to six lozenges.

**Liquor Sodæ Effervescens**—Effervescing solution of Soda. Soda water.

PREPARATION.—*Take of bicarbonate of soda, 30 grains; water, 1 pint. Dissolve the bicarbonate of soda in the water, and filter the solution; then pass into it as much pure washed carbonic-acid gas, obtained by the action of sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed to prevent the escape of the compressed gas.*

*Characters and Tests.*—Effervesces strongly when the containing vessel is opened, carbonic-acid gas escaping. The liquid is clear and sparkling, and has an agreeable acidulous taste. Ten fluid ounces after being boiled for five minutes, require for neutralisation 178 grain measures of the volumetric solution of oxalic acid.

It is given as a cooling antacid drink, and has all the actions of the bicarbonate of soda.

*Therapeutics.*—Bicarbonate of soda acts as an antacid and alterative, and is employed in dyspepsia, in acidity of the primæ viæ, in pyrosis, &c., for the same purposes as the corresponding salt of potash. As an antilithic, the potash salt is preferable, because urate of soda is much less soluble than urate of potash; and for the same reason the bicarbonate of soda is less eligible in gout and rheumatism. It has been recommended, dissolved in hot water, as a drink during the passage of gall stones; also to allay the vomiting of pregnancy. Externally, it is applied to a variety of skin diseases, either in the form of lotion, baths, or ointment, and is also given internally for the same purpose. In the form of Soda Water and Alkaline Mineral Waters it is largely used; but when long continued, in any form, it interferes with the processes of digestion and assimilation, and is contraindicated in all cases accompanied by deposition of phosphates in the urine.

**Sodii Chloridum** ($NaCl$)—Cloride of Sodium—Common Salt—Table Salt—Sea-Salt—Rock-Salt.

Chloride of Sodium is largely distributed throughout nature, both in the solid form of fossil and in beds of rock, and in solution in the sea and in brine-springs. It is also met with in animal and vegetable tissues and fluids. The salt of commerce is obtained either by evaporating brine-springs or sea-water, or by quarrying it from the rock-salt mines. In order to obtain the chloride in a pure state, the commercial varieties are frequently dissolved, washed, and recrystallized.

*Characters and Tests.*—In small white crystalline grains, or transparent cubic crystals, free from moisture, has a purely saline taste, imparts a yellow colour to flame, is soluble in water. The solution is not precipitated by perchloride of platinum, but gives with nitrate of silver a white precipitate, soluble in ammonia but insoluble in nitric acid.

*Dose.*—In doses of one or more table-spoonfuls, dissolved in water, it acts as an emetic and cathartic. In doses of half-an-ounce to an ounce, dissolved in a suitable fluid, it operates as a cathartic enema.

*Therapeutics.*—Chloride of sodium is essential as an adjunct to ordinary articles of diet; without it animal life cannot be sustained, and even its temporary withdrawal is followed by diseases. In small quantities it acts as an alterative and stimulant, rendering the food palatable, and improving the powers of digestion. In very large doses it acts as an irritant poison, causing inflammation of the alimentary mucous membrane; half-a-pound, taken as a cure for worms, caused the death of a young lady, and a pound, taken in a pint of ale, killed a man in twenty-four hours; but much smaller quantities, as one or two ounces, have caused alarming symptoms. Medicinally, salt is given as an anthelmintic, and is administered both by the stomach and by the rectum; it has been recommended in large and frequently-repeated doses in cholera. Externally, salt acts as a rubefacient and stimulant; in the form of salt-water baths it is employed as a discutient, tonic, and deobstruent, sometimes combined with the internal use of sea-water. A saturated solution of salt is used as a collyrium in chronic granular ophthalmia. Chloride of sodium is also used as an antidote in poisoning by nitrate of silver, and to cause the removal of leeches from the skin, or their death, when they have accidentally entered any of the orifices of the body.

**Borax** ($Na_2B_4O_7,10H_2O$)—Sodæ Biboras—Biborate of Soda.—Borax was formerly chiefly imported from India under the names of *Tincal* and *Crude Borax;* in this form it occurs as a natural production, by spontaneous evaporation, on the shores of certain lakes in Thibet; from this the refined Borax was obtained either by calcination or by washing in an alkaline ley. It is now manufactured by saturating boracic acid, obtained from the lagoons of Tuscany, with carbonate of soda; the mixture is thrown in successive quantities upon the floor of a reverberatory furnace, and impurities are subsequently separated by lixiviation.

*Characters.*—In transparent colourless crystals, sometimes slightly effloresced, with a weak alkaline reaction; insoluble in rectified spirit, soluble in water. A hot saturated solution, when acidulated with any of the mineral acids, lets fall, as it cools, a scaly crystalline deposit (boracic acid), the solution of which in spirit burns with a green flame.

MEL BORACIS—*Borax Honey* (not officinal).—*Take of borax, in fine powder,* 64 *grains; clarified honey,* 1 *ounce. Mix.*

*Dose.*—Fifteen or twenty to thirty grains, dissolved in water. As a lotion or gargle, three or four drachms in eight ounces of water. The honey may be allowed to dissolve in the mouth, or be dissolved in water to make a wash or gargle.

**Glycerinum Boracis**—Glycerine of Borax.

PREPARATION.—*Take of Borax, in powder,* 1 *ounce; glycerine,* 4 *fluid ounces. Rub them together in a mortar until the borax is dissolved.*

This preparation may be used instead of mel boracis, and is, besides, very suitable for making a gargle, in the strength of about one ounce to eight ounces of water.

*Therapeutics.*—Borax is said to act as an antacid, antilithic, diuretic, refrigerant, and emmenagogue, and topically as an astringent. It is chiefly used as an application to the mouth in cases of aphthous ulcerations, fissures of the tongue, and mercurial salivation. Externally, it is applied as an application to sore nipples, and to certain skin diseases, such as pityriasis versicolor, impetigo, psoriasis, eczema, acne, prurigo, &c.; also, dissolved in distilled vinegar, as an application to ringworm. As an injection, it is used in leucorrhœa, and in gonorrhœa, and into the bladder as a solvent for calculi. It is not much given internally, but has been recommended as an emmenagogue, and to stimulate the uterus in cases of tedious labour and retention of the placenta. It is more than doubtful, however, whether it possesses any real oxytocic virtues. It has been criminally used to cause abortion, and has occasionally produced that effect when administered for other purposes.

**Sodæ Sulphas** ($Na_2SO_4$, $10H_2O$)—Sulphate of Soda—Glauber's Salt.

PREPARATION.—*May be obtained from the residue left in the manufacture of hydrochloric acid, by neutralising it with carbonate of soda, and crystallizing from solution in water.*

*Characters.*—In transparent oblique prisms; has a salt and bitter taste; effloresces on exposure to the air; soluble in water, insoluble in spirit.

*Dose.*—One quarter to one ounce.

*Therapeutics.*—Sulphate of soda is a mild but efficient cooling laxative and diuretic in medicinal doses. It also increases slightly the biliary secretion, and prevents cholesterin concretions or gall stones and renal calculi. In very large doses, and sparingly diluted, it has been known to act as an irritant poison. It is used as a purgative, either alone or combined with other purgatives, and is especially suited for febrile cases, owing to its refrigerant properties; but the sulphate of magnesia is generally preferred to it, on account of its taste being less bitter. Like the magnesian sulphate, it may be used as an antidote for poisoning with lead and baryta.

**Sodæ Phosphas** ($Na_2HPO_4,12H_2O$)—Phosphate of Soda.

PREPARATION.—*Take of bone-ash, in powder,* 10 *pounds; sulphuric acid,* 56 *fluid ounces; distilled water,* 4½ *gallons, or a sufficiency; carbonate of soda,* 16 *pounds, or a sufficiency. Place the bone-ash in a capacious earthenware or leaden vessel, pour on the sulphuric acid, and stir with a glass rod, until the whole powder is thoroughly moistened. After twenty-four hours, add gradually, and with constant stirring, a gallon of the water; digest for forty-eight hours, adding distilled water from time to time to replace what has evaporated. Add another gallon of the water, stirring diligently, digest for an hour, filter through calico, and wash what remains on the filter with successive portions of distilled water, till it has almost ceased to have an acid reaction. Concentrate the filtrate to a gallon, let it rest for twenty-four hours, and filter again. Heat the filtrate to near the boiling point, add the carbonate of soda, previously dissolved in two gallons of the water, till it ceases to form a precipitate, and the fluid has acquired a feeble alkaline reaction. Filter through calico, evaporate the clear liquor till a film forms on the surface, and set it aside to crystallize. More crystals will be obtained by evaporating the mother-liquor, a little carbonate of soda being added if necessary to maintain its alkalinity. Dry the crystals rapidly, and without heat, on filtering paper placed on porous bricks, and preserve them in stoppered bottles.*

*Characters.*—In transparent, colourless rhombic prisms, terminated by four converging planes, efflorescent, tasting like common salt. It imparts a yellow colour to flame. Its solution has a faintly-alkaline reaction, it gives a yellow precipitate with nitrate of silver, the resulting fluid acquiring an acid reaction.

*Dose.*—As a saline cathartic, half-an-ounce to an ounce or more, in solution, or as a substitute for common salt, in broth or soup. In smaller doses it is alterative and antilithic.

*Therapeutics.*—Phosphate of soda acts as a mild saline cathartic, producing thin, watery stools, and, being less offensive to the palate than the sulphates of soda or magnesia, it is suitable for children or delicate adults. When given in mutton, veal, or chicken broth, its taste is scarcely distinguishable from that of common salt. It is employed in cases of simple constipation; in the saline treatment of cholera; as a solvent of uric acid deposits; as a gentle aperient in diabetes; as a local application in gout, &c.

## Sodæ Acetas ($NaC_2H_3O_23H_2O$)—Acetate of Soda.

Acetate of soda may be prepared by the action of carbonate of soda upon acetic acid, or by saturating impure pyroligneous acid with chalk or slaked lime, and afterwards decomposing the acetate of lime by means of sulphate of soda.

*Characters.*—In transparent, colourless crystals, soluble in water, forming a solution neutral to test-paper.

*Uses.*—Acetate of soda is used as a test, and is employed in the preparation of glacial acetic acid and of phosphate of iron. Medicinally, it is scarcely ever used. Its properties and doses are similar to those of acetate of potash.

### **Sodæ Citrotartras Effervescens**—Effervescing Citrotartrate of Soda.

PREPARATION.—*Take of bicarbonate of soda, in powder,* 17 *ounces; tartaric acid, in powder,* 8 *ounces; citric acid, in powder,* 6 *ounces. Mix the powders thoroughly, place them in a dish or pan of suitable form, heated to between* 200° *and* 220°, *and when the particles of the powder begin to aggregate, stir them assiduously until they assume a granular form; then, by means of suitable sieves, separate the granules of uniform and most convenient size, and preserve the preparation in well-closed bottles.*

*Dose.*—Sixty grains to half-an-ounce.

*Therapeutics.*—The granular form is especially convenient, as it allows the water to act gradually upon the salt, and thus moderates the rapidity of effervescence. The preparation is apt to absorb water from the air, whereby its constituents combine chemically, forming the citrate and tartrate of soda; hence the necessity of keeping it in stoppered bottles.

It is an exceedingly agreeable antacid effervescent refrigerant drink in teaspoonful doses. A teaspoonful may be put into a tumbler, about two-thirds full of water, mixed with a little sugar. It should be taken while the effervescence is going on. In doses of from two drachms to half-an-ounce it is a mild saline purgative, superior to the popular medicine known by the name of the granulated effervescing citrate of magnesia, which usually contains a considerable amount of sulphate of magnesia.

### **Soda Tartarata** ($NaKC_4H_4O_6 4H_2O$)—Sodæ et Potassæ Tartras—Tartrate of Soda and Potash—Sel de Seignette—Rochelle Salt.

PREPARATION.—*Take of acid tartrate of potash, in powder,* 16 *ounces, or a sufficiency; carbonate of soda,* 12 *ounces, or a sufficiency;*

*boiling distilled water,* 4 *pints. Dissolve the carbonate of soda in the water, add gradually the acid tartrate of potash, and if, after being boiled for a few minutes, the liquid has an acid or alkaline reaction, add a little carbonate of soda or acid tartrate of potash, till a neutral solution is obtained. Boil and filter; concentrate the liquor till a pellicle forms on the surface, and set it aside to crystallize. More crystals may be obtained by again evaporating as before.*

*Characters.*—In colourless, transparent prisms or halves of prisms of the right rhombic order, generally eight-sided; tasting like common salt. Heated with sulphuric acid, it blackens, evolving inflammable gases and the odour of burnt sugar. It imparts a yellow colour to flame. A strong solution gives a crystalline precipitate with a small quantity of acetic acid.

*Dose.*—From thirty grains to half-an-ounce, well-diluted. It is the active ingredient of Seidlitz powders, each of which contains 120 grains of the salt, with 40 grains of bicarbonate of soda in the blue paper, and 30 grains of tartaric acid in the white.

*Therapeutics.*—Tartrate of soda and potash in small doses acts as a diuretic, and renders the urine alkaline. In the larger doses it acts as a mild saline cathartic. It is cooling, and therefore a suitable aperient in febrile and inflammatory states; and as an antilithic it is useful in uric acid deposits; it is given also in gout and rheumatism.

**Sodæ Nitras**—Nitrate of Soda—A native salt purified by crystallization from water.

*Characters.*—In colourless obtuse rhombohedral crystals, having a cooling saline taste. Thrown on the fire, it deflagrates.

*Therapeutics.*—It is only used to prepare the arseniate of soda.

**Sodæ Valerianas** ($NaC_5H_9O_2$)—Valerianate of Soda.

PREPARATION.—*Take of amylic alcohol (fousel oil),* 4 *fluid ounces; bichromate of potash,* 9 *ounces; sulphuric acid,* 6½ *fluid ounces; solution of soda, a sufficiency; distilled water,* ½ *gallon. Dilute the sulphuric acid with* 10 *fluid ounces of the water, and dissolve the bichromate of potash in the remainder of the water with the aid of heat. When both liquids are cold, mix them with the fousel oil in a matrass, with occasional brisk agitation, until the temperature of the mixture has fallen to about* 90°. *Connect the matrass with a condenser, and distil until about half-a-gallon of liquid has passed over. Saturate the distilled liquid accurately with the solution of soda, remove any oil which floats on the surface, evaporate till the watery vapour ceases to escape,* *and then raise the heat cautiously so as to liquefy the salt. When the product has cooled and solidified, break it into pieces, and immediately put it into a stoppered bottle.*

*Characters.*—In dry white masses, without alkaline reaction, entirely soluble in rectified spirit, and giving out a powerful odour of valerian on the addition of diluted sulphuric acid.

*Therapeutics.*—Valerianate of soda is employed in the preparation of the valerianates.

**LITHIUM** (L = 7) obtains its name from λίθος, *a stone*, and from the fact that it was at first believed to belong only to the mineral kingdom; but though sparingly, it is widely distributed. It is a white or reddish-white metal, of a hardness between that of potassium and lead. It is the lightest of known solid substances (sp. gr. 0·5936), burns in air with a brilliant bright light, forming its only oxide—lithia.

**Lithia** ($L_2O$) is obtained chiefly from the minerals, *lepidolite, triphane*, and *petalite;* it is met with also in fire-clay, in many micas and felspars, in several mineral springs, &c.

**Lithiæ Carbonas** ($L_2CO_3$)—Carbonate of Lithia—may be prepared by adding a strong solution of carbonate of ammonia to a concentrated solution of the sulphate of lithia, and heating the mixture, from which the carbonate separates as a white deposit, which may be crystallized by cooling from a solution in water.

*Characters.*—In white powder or in minute crystalline grains alkaline in reaction, soluble in 100 parts of cold water, insoluble in alcohol. It dissolves with effervescence in hydrochloric acid; and the solution, evaporated to dryness, leaves a residue of chloride of lithium, which communicates a red colour to the flame of a spirit-lamp, and, redissolved in water, yields a precipitate with phosphate of soda.

Liquor Lithiæ Effervescens—Effervescing Solution of Lithia. Aqua Lithiæ Effervescens—Lithia Water.

Preparation.—*Take of carbonate of lithia,* 10 *grains; water,* 1 *pint. Mix in a suitable apparatus, and pass into it as much pure washed carbonic-acid gas, obtained by the action of sulphuric acid on chalk, as can be introduced with a pressure of seven atmospheres. Keep the solution in bottles securely closed, to prevent the escape of the compressed gas.*

*Dose.*—Five to ten fluid ounces.

*Therapeutics.*—This preparation has been made officinal chiefly to ensure a standard strength, and is simply a pleasant mode of administering the carbonate of lithia.

Carbonate of lithia acts as an alkaline, antilithic, lithontripic, and diuretic. In consequence of its low combining proportion, it neutralises more acid than an equal quantity of the corresponding salts of potash and soda; and it has, therefore, been recommended as a superior remedy in the treatment of the uric acid and gouty diathesis; and not only because of its stronger affinity for uric acid, but also because urate of lithia is exceedingly soluble, it is also diuretic, and so favours the elimination of urate of lithia.

*Dose.*—Two to six grains well diluted. It may also be employed externally (Garrod), as a lotion, four grains to the ounce, to parts affected with gouty inflammation, to joints stiffened by chronic gout, to gouty ulcers, and chalk stones covered with unbroken skin.

## Lithiæ Citras ($L_3C_6H_5O_7$)—Citrate of Lithia.

PREPARATION.—*Take of carbonate of lithia,* 50 *grains; citric acid in crystals,* 90 *grains; warm distilled water,* 1 *fluid ounce. Dissolve the citric acid in the water, and add the carbonate of lithia in successive portions, applying heat until effervescence ceases, and a perfect solution is obtained. Evaporate by a steam or sand bath till water ceases to escape, and the residue is converted into a viscid liquid. This should be dried in an oven or airchamber at the temperature of about* 240°, *then rapidly pulverised, and enclosed in a stoppered bottle.*

*Characters.*—A white amorphous powder, deliquescent, and soluble in water, without leaving any residue. Heated to redness it blackens, evolving inflammable gases; and the residue, neutralised by hydrochloric acid, yields with rectified spirit a solution which burns with a crimson flame.

*Actions and uses* same as the carbonate, than which it is much more soluble, and unlike which, it is deliquescent. It is converted into the carbonate in the system. It may be given in somewhat larger doses than the carbonate.

**AMMONIUM** ($NH_4 = 18$).—This is the hypothetical compound base of the ammonia salts. Their chief source is gas liquor obtained in the distillation of coal. This is neutralised by hydrochloric acid, and yields the chloride of ammonia, $NH_4Cl$, and from the salt the preparations used in pharmacy are directly or indirectly made.

**Liquor Ammoniæ Fortior**—Aqua Ammoniæ Fortior—Strong Solution of Ammonia.—Ammoniacal gas, $NH_3$, dissolved in water, and constituting 32·5 per cent. of the solution.

PREPARATION.—*Take of chloride of ammonium, in coarse powder, 3 pounds; slaked lime, 4 pounds; distilled water, 32 fluid ounces. Mix the lime with the chloride of ammonium, and introduce the mixture into an iron bottle placed in a metal pot surrounded by sand. Connect the iron tube, which screws air-tight into the bottle in the usual manner by corks, glass tubes, and caoutchouc collars, with a Woulf's bottle capable of holding a pint; connect this with a second Woulf's bottle of the same size, the second bottle with a matrass of the capacity of three pints, in which twenty-two ounces of the distilled water are placed, and the matrass, by means of a tube bent twice at right angles, with an ordinary bottle containing the remaining ten ounces of distilled water. Bottles one and two are empty, and the latter and the matrass which contains the twenty-two ounces of distilled water are furnished each with a siphon safety-tube charged with a very short column of mercury. The heat of a fire, which should be very gradually raised, is now to be applied to the metal pot, and continued until bubbles of condensible gas cease to escape from the extremity of the glass tube which dips into the water of the matrass. The process being terminated, the matrass will contain about forty-three fluid ounces of strong solution of ammonia.*

*Characters.*—A colourless liquid, with a characteristic and very pungent odour, and strong alkaline reaction.

LIQUOR AMMONIÆ—SOLUTION OF AMMONIA.—*Take of strong solution of ammonia, 1 pint; distilled water, 2 pints. Mix and preserve in a stoppered bottle.*

*Dose.*—Ten to thirty min., well diluted with water.

LINIMENTUM AMMONIÆ—LINIMENT OF AMMONIA.—*Take of solution of ammonia, 1 fluid ounce; olive oil, 3 fluid ounces. Mix together with agitation.*

*Therapeutics.*—Gaseous ammonia, in the undiluted state, is irrespirable, causing spasm of the glottis and asphyxia; when somewhat diluted with atmospheric air, it acts as a violent irritant of the respiratory mucous membrane, and is capable of causing death by producing inflammation of the air passages. Strong solution of ammonia also acts as a violent irritant and corrosive poison, causing intense burning pain in the mouth, pharynx, œsophagus, and stomach, great difficulty in swallowing, sense of suffocation, and pain in the respiratory organs. Sometimes there is vomiting and purging, &c. Poisoning by ammonia and its carbonate resembles that by the caustic alkalies, potash and soda and their carbonates; but in consequence of its volatility the air-passages are always seriously implicated in the ammonia cases. Great care should be taken when ammonia is employed as a restorative, in cases where the patient is insensible, that the vapour or solution be sufficiently diluted; otherwise dangerous results may ensue. Treatment, give dilute acids and treat the symptoms. Externally, ammonia acts also as a powerful local irritant, producing rubefaction, vesication, or cauterisation, according to the strength and length of time of the application. Medicinally, ammonia is employed as a diffusible stimulant and restorative, antacid, antispasmodic, diaphoretic, sudorific, expectorant, antidote, counter-irritant, vesicant, &c. It has been recommended in the later stages of febrile and inflammatory diseases, and in other cases where there is great nervous prostration, and to promote the eruption in febrile exanthemata; in the later stages of pneumonia, and in chronic bronchitis; in atonic dyspepsia, with acidity of the primæ viæ, and flatulence; in syncope; in hysteria; to dissipate the effects of alcohol; in delirium tremens; as an antidote to sedative poisons, such as hydrocyanic acid, digitalis, &c. Externally, it is employed as a counter-irritant in chronic pulmonary affections, in tic douloureux and other neuralgic affections; it is used also as an adjunct to stimulating embrocations, to be applied to sprains, rheumatic pains, stiff joints, sore throat, ringworm, alopœcia, &c. As an antidote to the bites of serpents and venomous insects it is both locally applied and given internally; but as an antidote for snake-bites it is useless (Sir J. FAYRER). As a vesicant, it may be employed when prompt vesication is demanded, and in cases, especially affections of the urinary organs, in which cantharides is contra-indicated.

SPIRITUS AMMONIÆ FŒTIDUS—FETID SPIRIT OF AMMONIA.—*Take of assafœtida, 1½ ounce; strong solution of ammonia, 2 fluid ounces; rectified spirit, a sufficiency. Break the assafœtida into small pieces and macerate it, in a closed vessel, in 15 fluid ounces of the spirit for twenty-four hours, then distil off the spirit, mix the product with the solution of ammonia, and add sufficient rectified spirit to make 1 pint.*

*Dose.*—One-half to one fluid drachm.

*Therapeutics.*—This preparation is intended to combine the stimulant and antispasmodic effects of the ammonia and assafœtida. It is suitable for cases of hysteria, but its disagreeable taste and odour form serious objections to its use.

**Ammoniæ Carbonas**—Carbonate of Ammonia—Ammoniæ Sesquicarbonas, $N_4H_{16}C_3O_8$ — Sal Volatile. A volatile, pungent, ammoniacal salt, produced by submitting a mixture of sulphate of ammonia, or chloride of ammonium, and carbonate of lime to sublimation.

*Characters.*—In translucent crystalline masses, with a strong ammoniacal odour and alkaline reaction; soluble in cold water, more sparingly in spirit, and readily dissolved by acids with effervescence.

When exposed to the air it loses, in a great measure, its pungent odour; is no longer translucent, but covered with a white powder, being converted into bicarbonate.

*Dose.*—Two to ten grains in solution.

SPIRITUS AMMONIÆ AROMATICUS—AROMATIC SPIRIT OF AMMONIA—SPIRIT OF SAL VOLATILE.—*Take of carbonate of ammonia,* 8 *ounces; strong solution of ammonia,* 4 *fluid ounces; volatile oil of nutmeg,* 4 *fluid drachms; oil of lemon,* 6 *fluid drachms; rectified spirit,* 6 *pints; water,* 3 *pints. Mix, and distil* 7 *pints.*

*Dose.*—Twenty to sixty min.

*Therapeutics.*—Carbonate of ammonia acts as a stimulant, antacid, diaphoretic, expectorant, antispasmodic, &c.; in larger doses, as an emetic, and in over-doses as an irritant poison. Medicinally, the carbonate is employed in the same cases as were mentioned under liquor ammoniæ. It has been recommended in diabetes, scarlatina, rubeola, erysipelas, &c. As an emetic, it is sometimes used in narcotic poisoning, in chronic bronchitis, suffocative catarrh, and other cases in which there is great debility. Aromatic spirit of ammonia is used as an agreeable substitute for liquor ammoniæ, which it resembles, in proportion to its strength, in medicinal properties.

**Ammonii Chloridum** ($NH_4Cl$)—Chloride of Ammonium —Hydrochlorate of Ammonia—Sal Ammoniac. May be formed by neutralising hydrochloric acid with ammonia, and evaporating to dryness. It is usually prepared by sublimation.

*Characters.*—In colourless, inodorous, translucent, fibrous masses, tough, and difficult to powder; soluble in water and in rectified spirit. Its aqueous solution when heated with caustic potash evolves ammonia, and when treated with nitrate of silver forms a copious curdy precipitate.

*Therapeutics.*—Chloride of ammonium in over-doses acts as an irritant poison; in small medicinal doses it is stated to be alterative, sedative, diaphoretic, diuretic, emmenagogue, resolvent, liquefacient, discutient, refrigerant, &c., and in larger doses purgative. Formerly it was but little used internally in this country, though highly valued on the Continent; but more recently it has met with greater acceptance. It has been recommended as a substitute for mercury and iodide of potassium for the removal of chronic indurations and enlargements, and in chronic inflammatory diseases, especially in acute congestion of the liver (Dr. Stewart); it has been given in neuralgic and rheumatic affections, in hemorrhages from the lungs, stomach, and uterus; in passive dropsies, especially of hepatic origin; in typhus, typhoid, and intermittent fevers; in chronic affections of the lungs, &c. In facial neuralgia originating in, or aggravated by, toothache, it frequently gives great relief. Externally, as a discutient lotion applied to glandular enlargements, incipient abscesses, ecchymoses, &c.; and as a refrigerant lotion in affections of the brain, sprains, &c.

*Dose.*—Five to thirty grains.

**Ammoniæ Acetatis Liquor.** Solution of Acetate of Ammonia—Acetate of Ammonia ($NH_4C_2H_3O_2$) dissolved in water—Aqua Ammoniæ Acetatis—Spiritus Mindereri.

Preparation.—*Take of acetic acid, 10 fluid ounces; carbonate of ammonia, 3¼ ounces, or a sufficiency; distilled water, 2½ pints. Reduce the carbonate of ammonia to powder, and add it gradually to the acetic acid until a neutral solution is formed, then add the water.*

*Dose.*—Two to six fluid drachms.

*Therapeutics.*—Solution of acetate of ammonia acts as a diaphoretic, diuretic, and refrigerant. Internally it is administered at the outset of febrile and inflammatory cases, especially in the exanthemata; in influenza; in catarrh; in dysmenorrhœa; in inflammatory dropsy; in fits of drunkenness, &c.

**Liquor Ammoniæ Citratis**—Solution of the Citrate of Ammonia—Citrate of Ammonia ($(NH_4)_3C_6H_5O_7$), dissolved in water.

Preparation.—*Take of citric acid, 3 ounces; strong solution of ammonia, 2¾ fluid ounces, or a sufficiency; distilled water, 1 pint. Dissolve the citric acid in the water, and add the solution of ammonia until the liquid is neutral to test-papers.*

*Dose.*—Two to six fluid drachms.

*Therapeutics.*—The solution of citrate of ammonia acts as a febrifuge, refrigerant, diaphoretic, and diuretic, and is employed in the same cases as solution of the acetate, than which it is considered to be more agreeable.

### **Ammoniæ Benzoas** ($NH_4C_7H_5O_2$)—Benzoate of Ammonia.

PREPARATION.—*Take of solution of ammonia, 3 fluid ounces, or a sufficiency; benzoic acid, 2 ounces; distilled water, 4 fluid ounces. Dissolve the benzoic acid in three fluid ounces of solution of ammonia previously mixed with the water; evaporate at a gentle heat, keeping ammonia in slight excess, and set aside, that crystals may form.*

*Characters.*—In colourless laminar crystals, soluble in water and alcohol. It gives a bulky yellowish precipitate with persalts of iron. Its aqueous solution, when heated with caustic potash, evolves ammonia, and if it be not too dilute, when accidulated with hydrochloric acid, it gives a deposit of benzoic acid.

*Dose.*—Ten to thirty grains, in solution.

*Therapeutics.*—Benzoate of ammonia possesses medicinal properties similar to those of benzoic acid, than which it is more soluble, and therefore preferable. It renders the urine acid and irritating, its benzoic acid being converted into hippuric acid, in which state it is eliminated by the kidneys. It acts as a stimulating diuretic, and as a stimulant both to the urinary and pulmonary mucous membranes. It has been recommended in chronic inflammation with mucous discharge from the bladder, and in all cases in which there is a tendency to phosphatic deposits; in catarrhal affections of the pulmonary mucous membranes; in jaundice; and also in cases of uric-acid deposits, and in gout, on the supposition that it possesses the property of converting uric acid into hippuric acid, but probably it has no such influence.

### **Ammoniæ Nitras** ($NH_4NO_3$)—Nitrate of Ammonia.

Produced by neutralising diluted nitric acid with solution of ammonia or carbonate of ammonia, evaporating the solution till crystals are obtained, and keeping these fused, at a temperature not exceeding 320°, until the vapour of water is no longer emitted.

*Characters.*—A white deliquescent salt, in confused crystalline masses, having a bitter acrid taste. Soluble in less than its own weight of water, and sparingly soluble in rectified spirit.

This salt is used almost exclusively for the preparation of nitrous oxide gas.

**Ammoniæ Phosphas** ($(NH_4)_2HPO_4$)—Phosphate of Ammonia.

Preparation.—*Take of diluted phosphoric acid, 20 fluid ounces; strong solution of ammonia, a sufficiency. Add the ammonia to the phosphoric acid until the solution is slightly alkaline; then evaporate the liquid, adding more ammonia from time to time, so as to keep it in slight excess, and when crystals are formed on the cooling of the solution, dry them quickly on filtering paper placed on a porous tile, and preserve them in a stoppered bottle.*

*Characters.*—In transparent colourless prisms; soluble in water, insoluble in rectified spirit. When heated with caustic potash, ammonia is evolved; the aqueous solution gives a yellow precipitate with nitrate of silver.

*Dose.*—Ten to forty grains, in solution.

*Therapeutics.*—Phosphate of ammonia has been chiefly recommended in the uric acid and gouty diatheses; it is supposed to dissolve the urate of soda by forming the urate of ammonia and phosphate of soda, both of which are soluble. It has also been employed in rheumatism, and as a diaphoretic and discutient.

AMMONIÆ HYDROSULPHURETUM — Hydrosulphuret of Ammonia mentioned amongst the test solutions, was formerly used in the treatment of diabetes, for the purpose of controlling the morbid appetite; it has also been recommended in heart disease, consumption, &c., but is scarcely ever used.

## GROUP II. METALS OF THE ALKALINE EARTHS—BARIUM, CALCIUM, MAGNESIUM.

**BARIUM** ($Ba=137$) is a greyish-white metal, having somewhat the appearance of silver; it melts below a red heat, burns with a red light, and, when exposed, soon oxidises. It is the metallic base of

BARYTA ($BaO$)—Barytes—Baryta—Oxide of Barium—takes its name from its great weight (Βαρύς, *heavy*). It has an alkaline taste and reaction, and is very poisonous.

BARII CHLORIDUM ($BaCl_2$)—Chloride of Barium is placed in the Appendix of the Pharmacopœia. It may be prepared by the action of hydrochloric acid upon carbonate of baryta ($BaCO_3+2HCl=BaCl_2+H_2O+CO_2$), or by first heating sulphate of baryta with charcoal, whereby it is converted into sulphuret or sulphide of barium, and acting upon this with hydrochloric acid ($BaS+2HCl=H_2S+BaCl_2$). It forms colourless, transparent, tabular, four-sided crystals or rhombic plates, bevelled at the edges; these are permanent in air, or efflorescent, if the air be very dry; are inodorous, and have a disagreeable bitter acrid taste. With sulphuric acid and soluble sulphates, chloride of barium throws down a dense white precipitate, insoluble in nitric acid. Medicinally, chloride of barium has been employed as an alterative, tonic, and deobstruent in scrofulous affections, &c.; but it is highly poisonous, and is rarely used. Dose—half-a-grain to a grain or two grains, only in solution. Antidote—a soluble sulphate (especially Epsom salts), to form the insoluble sulphate of Baryta.

**CALCIUM** ($Ca=40$) is a yellowish malleable metal; sp. gr. 1·57. It is fusible at a red heat, and burns when heated in air. It slowly oxidises when exposed to the atmosphere, and is the metallic base of

**Calx** ($CaO$)—Oxide of Calcium—Lime—Caustic Lime—Quicklime. An alkaline earth ($CaO$) with some impurities, obtained by calcining chalk or limestone, so as to expel carbonic acid.

*Characters.*—In compact masses of a whitish colour, which readily absorb water, and which, when rather less than their weight of water is added, crack and fall into powder with the development of much heat. The powder obtained by this process of slaking, when agitated with distilled water, gives, after filtration, a clear solution, which has an alkaline reaction, and yields a white precipitate with oxalate of ammonia.

CALCIS HYDRAS ($CaH_2O_2$)—HYDRATE OF LIME—SLAKED LIME.—*Take of lime, 2 pounds; distilled water, 1 pint. Place the lime in a metal pot, pour the water upon it, and, when vapour ceases to be disengaged, cover the pot with its lid, and set it aside to cool. When the temperatare has fallen to that of the atmosphere, put the slaked lime on an iron-wire sieve, and, by gentle agitation, cause the fine powder to pass through the sieve, rejecting what is left. Put the powder into a well-stoppered bottle, and keep it excluded as much as possible from the air. Slaked lime should be recently prepared.*

LIQUOR CALCIS—SOLUTION OF LIME—LIME WATER.—*Take of slaked lime, 2 ounces; distilled water, 1 gallon. Put the lime into a stoppered bottle containing the water, and shake well for two or three minutes. After twelve hours the excess of lime will have subsided, and the clear solution may be drawn off with a siphon as it is required for* *use, or transferred to a green-glass bottle furnished with a well-ground stopper.*

LIQUOR CALCIS SACCHARATUS—SACCHARATED SOLUTION OF LIME.—*Take of slaked lime,* 1 *ounce; refined sugar, in powder,* 2 *ounces; distilled water,* 1 *pint. Mix the lime and the sugar by trituration in a mortar. Transfer the mixture to a bottle containing the water, and, having closed this with a cork, shake it occasionally for a few hours. Finally, separate the clear solution with a siphon, and keep it in a stoppered bottle.*

Solution of lime is a limpid, colourless, inodorous liquid, having a disagreeable, nauseous, caustic taste, and an alkaline reaction. When exposed to the air, it absorbs carbonic acid, which at first forms a pellicle of carbonate of lime upon the surface, and if further exposed, the whole of the lime is ultimately precipitated; hence it is necessary to keep it in constantly full and well-stoppered bottles, which are directed to be of green glass, because the lime slowly acts upon the oxide of lead of white bottles. Cold water dissolves more lime than that of a higher temperature. The addition of sugar increases the solubility of lime, so that the saccharated is much stronger than the simple solution, the latter containing only 0·56 of a grain, whilst the former contains 7·11 grains, in each ounce. The saccharated solution, being much stronger, has a more caustic and disagreeable taste than the simple solution; it also is readily converted into carbonate of lime by exposure to the atmosphere, and when two-thirds of the lime is thus changed, the solution becomes glutinous.

*Dose.*—Of the simple solution, half-an-ounce to two or three ounces, in milk, or alone; of the saccharated solution, half-a-drachm to two or three drachms, well diluted; for children, fifteen to thirty minims, well diluted; it may be given in milk.

*Therapeutics.*—Lime water acts as an antacid and astringent, and also as a sedative and lithontriptic, &c. It tends to turn the urine alkaline, and when long continued, it interferes with the functions of digestion and secretion, and therefore should be discontinued from time to time. It has been employed as an antacid in dyspepsia with vomiting, acidity of the stomach, and cardialgia; also in gastrodynia and ulcer of the stomach; in diarrhœa, especially of children; in dysentery; as a solvent of urates, it has been given in urinary deposits, and in the dyspepsia of gouty and rheumatic subjects; as an antidote to poisoning by the mineral acids and oxalic acid. As a lotion, it has been recommended in scabies, in tinea, and other skin diseases. As an injection, in leucorrhœa, in excoriations of the vaginal mucous membrane, in pruritus. As an enema, for the expulsion of ascarides, &c. In cases of chronic vomiting, the vomiting of pregnancy, and in the chronic diarrhœa of children, the saccharated solution, well diluted, is largely used.

LINIMENTUM CALCIS—LINIMENT OF LIME—CARRON OIL.—*Take of solution of lime and olive oil, of each,* 2 *fluid ounces. Mix together with agitation.*

This liniment was first used at the Carron Iron Works, and hence derived its popular name; it is applied to burns and scalds, and as an antidote in poisoning by the mineral acids, oxalic acid, arsenic, &c.

**Creta Preparata**—Prepared chalk freed from the most of its impurities by elutriation, and afterwards dried in small masses, which are usually of a conical form. It is carbonate of lime, $CaCO_3$, nearly pure.

*Characters.*—A white amorphous powder, effervescing with acids, and dissolving with only a slight residue in diluted hydrochloric acid. This solution, when supersaturated with solution of ammonia, gives, upon the addition of oxalate of ammonia, a copious white precipitate.

MISTURA CRETÆ—CHALK MIXTURE.—*Take of prepared chalk,* ¼ *ounce; gum acacia, in powder,* ¼ *ounce; syrup,* ½ *fluid ounce; cinnamon water,* 7½ *fluid ounces. Triturate the chalk and gum acacia with the cinnamon water, then add the syrup, and mix. Dose,* ½ *to* 2 *ounces.*

PULVIS CRETÆ AROMATICUS—AROMATIC POWDER OF CHALK.—*Take of cinnamon bark, in powder,* 4 *ounces; nutmeg, in powder, saffron, in powder, of each,* 3 *ounces; cloves, in powder,* 1½ *ounce; cardamon seeds, in powder,* 1 *ounce; refined sugar, in powder,* 25 *ounces; prepared chalk,* 11 *ounces. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Keep it in a stoppered bottle, Dose,* 10 *to* 60 *grains.*

**Calcis Carbonas Præcipitata** ($CaCO_3$)—Precipitated Carbonate of Lime.

PREPARATION.—*Take of chloride of calcium,* 5 *ounces; carbonate of soda,* 13 *ounces; boiling distilled water, a sufficiency. Dissolve the chloride of calcium and carbonate of soda each in two pints of the water; mix the two solutions, and allow the precipitate to subside. Collect this on a calico filter, wash it with boiling distilled water, until the washings *cease to give a precipitate with nitrate of silver, and dry the product at the temperature of* 212°.

*Characters.*—A white crystalline powder, insoluble in water, dissolving in hydrochloric acid with effervescence. The solution, when neutralised by ammonia, lets fall a copious white precipitate on the addition of oxalate of ammonia.

*Dose.*—Of creta preparata, or calcis carbonas præcipitata, ten to sixty grains.

*Therapeutics.*—Prepared (or precipitated) chalk acts as an antacid, astringent, absorbent, desiccant, antidote, &c. It is given as an antacid in dyspepsia with acidity, especially when complicated with diarrhœa, and in the diarrhœa of children. Externally, it is used as a desiccant, dusted over ulcers, burns, excoriations, &c., to absorb their irritating discharges and to exclude the air. It is used as an antidote in poisoning by the mineral acids, oxalic acid, and chloride of zinc. Chalk is apt to form intestinal concretions when it is long continued; to guard against this, an occasional laxative is necessary. Mistura cretæ and pulvis cretæ aromaticus are used to check diarrhœa.

### Calcii Chloridum—($CaCl_2$)—Chloride of Calcium.

PREPARATION.—*It may be formed by neutralising hydrochloric acid with carbonate of lime, adding a little solution of chlorinated lime and slaked lime to the solution, filtering, evaporating until it becomes solid, and finally, drying the salt at about* 400°.

*Characters.*—In white agglutinated masses, dry, but very deliquescent; evolves no chlorine or hypochlorous acid on the addition of hydrochloric acid, and is entirely soluble in twice its weight of water, also in alcohol.

*Therapeutics.*—Medicinally, chloride of calcium was formerly used in the treatment of scrofula, for the removal of glandular and other tumours, in certain chronic skin diseases, as lupus, in ovarian disease, &c. It is said to act as a stimulant of the lymphatic glandular system, and to be tonic and deobstruent. It had, however, gone greatly out of use till recommended of late years as an alterative and deobstruent in scrofula and phthisis by Dr. J. W. Begbie. It well deserves increased attention. It is given in solution, beginning with small doses (gr. v, thrice a-day, gradually increased to gr. xv), whilst at the same time solutions of different strength may be applied locally. Of the following solutions, which are placed in the Appendix of the Pharmacopœia as tests merely, the weaker may be given internally.

LIQUOR CALCII CHLORIDI — SOLUTION OF CHLORIDE OF CALCIUM.—*Take of chloride of calcium,* 1 *ounce; distilled water,* 10 *fluid ounces; dissolve and filter.* Of this solution, twenty drops, gradually increased to a drachm, may be given in milk.

SOLUTION (SATURATED) OF CHLORIDE OF CALCIUM.—*Take of chloride of calcium,* 4 *ounces; distilled water,* 5 *fluid ounces. Dissolve, and filter.* This is used only as a test.

OS USTUM—BONE ASH—*The residue of bones which have been burned to a white ash in contact with air. Consists principally of phosphate of lime mixed with about* 10 *per cent. of carbonate of lime, and a little fluoride of calcium and phosphate of magnesia.* It is used to prepare the phosphate of lime and the phosphate of soda.

## Calcis Phosphas—($Ca_3P_2O_8$).

PREPARATION.—*Take of bone ash,* 4 *ounces; hydrochloric acid,* 6 *fluid ounces; water,* 2 *pints; solution of ammonia,* 12 *fluid ounces, or a sufficiency; distilled water, a sufficiency. Digest the bone ash in the hydrochloric acid, diluted with a pint of water, until it is dissolved. Filter the solution, if necessary; add the remainder of the water, and afterwards the solution of ammonia, until the mixture acquires an alkaline reaction; and, having collected the precipitate on a calico filter, wash it with boiling distilled water as long as the liquid which passes through occasions a precipitate when dropped into solution of nitrate of silver acidulated with nitric acid. Dry the washed product at a temperature not exceeding* 212°.

*Characters.*—A light white amorphous powder, insoluble in water, but soluble, without effervescence, in diluted nitric acid. The solution continues clear when an excess of acetate of soda is added to it, but lets fall a white precipitate on the subsequent addition either of a little oxalate of ammonia or of perchloride of iron.

*Dose.*—Ten to twenty or thirty grains. Phosphate of lime may be elegantly prepared for medicinal use by dissolving it in dilute phosphoric acid, and forming it into a syrup. There are several such syrups, in which it is usually combined with phosphate of iron and other phosphates, and they are made so as to be given in tea-spoonful doses.

*Therapeutics.*—Phosphate of lime has been used in the treatment of rickets, mollities ossium, tabes mesenterica, scrofula, &c. It has been recommended with the view of supplying a deficiency of phosphate of lime to the system, but, practically, it has not succeeded.

**MAGNESIUM** ($Mg=12$) is a greyish-white or silvery metal, which is ductile and malleable, is fusible at a red heat, burns with an intensely brilliant white light, and is permanent in dry, but slowly oxidises in damp air.

**Magnesia** ($MgO$)—Magnesia—Oxide of Magnesium—Calcined Magnesia.

PREPARATION.—1. *Of Magnesia: Take of carbonate of magnesia*, 4 *ounces. Put it into a Cornish or Hessian crucible, closed loosely by a lid, and expose it to a low red heat, until a small quantity, taken from the centre of the crucible, when it has cooled, and dropped into diluted sulphuric acid, causes no effervescence.*

2. *Of Magnesia Levis: Take of light carbonate of magnesia*, 4 *ounces. Put it into a Cornish or Hessian crucible, closed loosely by a lid, and expose it to a low red heat, until a small quantity, taken from the centre of the crucible, when it has been cooled, and dropped into diluted sulphuric acid, causes no effervescence.*

*Characters.*—1. Of Magnesia: A white powder, insoluble in water, but readily dissolved by acids, without effervescence. Its solution in hydrochloric acid, when neutralised by a mixed solution of ammonia and chloride of ammonium, gives a copious crystalline precipitate when phosphate of soda is added to it.

2. Of Magnesia Levis: A bulky white powder, differing from the preceding preparation only in its greater levity, the volumes corresponding to the same weight being to each other in the ratio of three and a-half to one.

*Dose.*—Of either kind, ten to twenty grains as an antacid; twenty to sixty grains and upwards as a cathartic. For infants, two to ten grains. It may be given suspended in milk or water.

*Therapeutics.*—Magnesia, in both of these forms, acts as an antacid in small doses, and as a laxative in larger doses. It combines with the acids met with in the *primæ viæ* to form purgative salts. It tends to render the urine alkaline, and to diminish the quantity of uric acid and urates. It is employed as an antacid in acidity of the *primæ viæ*, with cardialgia and gastralgia, and especially in the acidity with diarrhœa of infants. It is said, also, to act as a sedative in the stomach and bowels, thereby, as well as by its antacid properties, diminishing gastro-intestinal irritation. It is given to arrest the vomiting produced by irritability of the stomach, and to relieve the vomiting and cardialgia incident to pregnancy. It is given in the gouty, rheumatic, and lithic-acid diatheses. As a purgative it is not much used, except in the double capacity of antacid and laxative. When given in large quantities, or long continued, it is apt to accumulate and form concretions of considerable size in the bowels,—a result which should be obviated by the occasional use of a brisk cathartic. In the absence of other remedies, it may be used as an antidote in cases of poisoning by the mineral acids; but the great heat generated by its use renders it objectionable. It is also used as an antidote in poisoning by oxalic acid, arsenic, &c.

**Magnesiæ Carbonas** ($(MgCO_3)_3MgO5H_2O$)—Carbonate of Magnesia.

PREPARATION.—1. *Of Carbonate of Magnesia: Take of sulphate of magnesia,* 10 *ounces; carbonate of soda,* 12 *ounces; boiling distilled water, a sufficiency. Dissolve the sulphate of magnesia and the carbonate of soda each in a pint of the water, mix the two solutions, and evaporate the whole to perfect dryness by means of a sand-bath. Digest the residue for half-an-hour with two pints of the water, and, having collected the insoluble matter on a calico filter, wash it repeatedly with distilled water, until the washings cease to give a precipitate with chloride of barium. Finally, dry the product at a temperature not exceeding* 212°.

2. *Of Light Carbonate of Magnesia: Take of sulphate of magnesia,* 10 *ounces; carbonate of soda,* 12 *ounces; distilled water, a sufficiency. Dissolve the sulphate of magnesia and the carbonate of soda each in half-a-gallon of the water, mix the two solutions cold, and boil the mixture in a porcelain dish for fifteen minutes. Transfer the precipitate to a calico filter, and pour upon it repeatedly boiling distilled water, until the washings cease to give a precipitate with chloride of barium. Lastly, dry by a heat not exceeding* 212°.

*Characters.*—1. Of Carbonate: A white granular powder, which dissolves with effervescence in the diluted mineral acids, yielding solutions which, when first treated with chloride of ammonium, are not disturbed by the addition of an excess of solution of ammonium, but yield a copious crystalline precipitate upon the addition of phosphate of soda.

2. Of Light Carbonate: A very light powder, which, when examined under the microscope, is found to be partly amorphous, with numerous slender prisms intermixed. The other characters and tests are the same as those of carbonate of magnesia.

*Dose* (of either kind).—As an antacid, ten to twenty grains; as a laxative, twenty to sixty grains, or more. It may be given suspended in milk or water, or in the form of an effervescing draught, in the proportion of fourteen grains to twenty grains of citric acid.

*Therapeutics.*—Carbonate of magnesia, in both of these forms, acts as an antacid, absorbent, and laxative. It resembles calcined magnesia in its medicinal properties, except that in its union with acids in the *primæ viæ* it disengages carbonic acid gas, giving rise to unpleasant eructations. It is employed as an antidote in poisoning by oxalic acid.

LIQUOR MAGNESIÆ CARBONATIS—Solution of Carbonate of Magnesia—Fluid Magnesia.

PREPARATION.—*Take of sulphate of magnesia,* 2 *ounces; carbonate of soda,* 2½ *ounces; distilled water, a sufficiency. Dissolve the two salts separately, each in half-a-pint of water. Heat the solution of sulphate of magnesia to the boiling point, then add to it the solution of carbonate of soda, and boil them together until carbonic acid ceases to be evolved. Collect the precipitated carbonate of magnesia on a calico filter, and wash it with distilled water until what passes ceases to give a precipitate with chloride of barium. Mix the washed precipitate with a pint of distilled water, and, putting them into a suitable apparatus, pass into it pure washed carbonic-acid gas, obtained by the action of sulphuric acid on chalk. Let the mixture remain in contact with excess of carbonic acid, retained there under pressure for about twenty-four hours, then filter the liquid to remove any undissolved carbonate of magnesia, and again pass carbonic acid gas into the filtered solution. Finally, keep the solution in a bottle, securely closed, to prevent the escape of carbonic acid. This solution contains about* 13 *grains of carbonate of magnesia in a fluid ounce.*

*Characters and Tests.*—Effervesces slightly, or not at all, when the containing vessel is first opened. The liquid is clear, and free from any bitter taste. A fluid ounce of it, evaporated to dryness, yields a white solid residue, which, after being calcined, weighs not less than five grains. This residue is insoluble in water, and answers to the tests for magnesia.

*Dose.*—One to two fluid ounces.

*Therapeutics.*—The magnesia is here kept in solution by the excess of carbonic acid. It is, properly speaking, a solution of the bicarbonate ($MgH_22CO_3$). This salt cannot be obtained in the solid form, but in solution forms a useful medicine, known by the names given in the Pharmacopœia as its synonyms, as well as some others, such as aërated magnesia water, &c., or distinguished by the names of the manufacturers, as Murray's, Dinneford's, Husband's fluid magnesia. It is an exceedingly agreeable form in which to prescribe magnesia; and now that it is included in the officinal list, a uniform strength is secured. On the escape of the carbonic acid, hydrated carbonate of magnesia is deposited; the solution should therefore be kept in well-stoppered bottles. Solution of bicarbonate of magnesia is used as an antacid, either alone or as an effervescing draught with nitric acid or lemon juice.

**Magnesiæ Sulphas**—($MgSO_4 7H_2O$)—Sulphate of Magnesia—Epsom Salts.

Sulphate of magnesia may be obtained either from *bittern* or from *dolomite.* Bittern is the liquid which remains after most of the chloride of sodium has been removed from *sea water* by evaporation; the bittern consists chiefly of sulphate of magnesia and chloride of magnesium in solution, and by boiling this down, with the addition of sulphuric acid, the chloride is converted into sulphate, which is thus obtained. When dolomite or magnesian limestone (carbonate of lime and magnesia) is used, it is first calcined, powdered, and diffused through water; sulphuric acid is then added to form the sulphates of lime and magnesia, from which the latter, from its ready solubility, is easily separated. From either of these sources the sulphate is subject to impurity: if from bittern, it may contain chlorides, and consequently be deliquescent; if from dolomite, it may contain iron, alumina, &c. Or it may be obtained from the native carbonate of magnesia (magnesite), by saturating it with sulphuric acid.

*Characters.*—In minute colourless and transparent rhombic prisms, possessing a bitter taste. It readily dissolves in water, and the solution gives copious white precipitates with chloride of barium, and with a mixed solution of ammonia, chloride of ammonium, and phosphate of soda.

ENEMA MAGNESIÆ SULPHATIS—ENEMA OF SULPHATE OF MAGNESIA.—*Take of sulphate of magnesia,* 1 *ounce; olive oil,* 1 *fluid ounce; mucilage of starch,* 15 *fluid ounces. Dissolve the sulphate of magnesia in the mucilage of starch, add the oil, and mix.*

*Dose.*—The sulphate of magnesia may be administered in doses of sixty grains to half-an-ounce, or more, largely diluted in water, with or without the addition of a little sulphuric acid, which renders it somewhat more palatable. It acts more effectively in proportion to its dilution. It may be given with infusion of senna, or acid infusion of roses.

A very good form for administering it also is the liquor magnesiæ sulphatis of Dr. Henry of Dublin, which is prepared in the following manner :—Take of saturated solution of sulphate of magnesia, 7 ounces (equal to 4 ounces of crystals) ; dilute sulphuric acid, 1 ounce ; mix. This is administered in doses of from one to two tablespoonfuls diluted in water. The officinal enema may be used in the quantity prescribed.

*Therapeutics.*—Sulphate of magnesia acts as a refrigerant and somewhat depressing saline cathartic, increasing the peristaltic action of the bowels, and producing watery evacutions. In small doses it is diuretic. It is a suitable purgative in the febrile and inflammatory affections of robust subjects; and in the constipation with congestion of the portal system in persons of plethoric habit. It is used as an antidote in cases of poisoning by the salts of lead and byrata, their sulphates being insoluble. It enters into the constitution of sea-water and of many mineral waters.

MAGNESIÆ CITRAS—Citrate of Magnesia—differs in its properties according to the method of its preparation; the intention is to produce $Mg_3 2C_6H_5O_7$, but it is difficult to prepare. When precipitated from a solution it is insoluble, but is more soluble if the ingredients (carbonate of magnesia and citric acid) are mixed in a dry state, or with the aid of a very small proportion of water, and at a low temperature. *Granular effervescing Citrate of Magnesia* is made with sulphate of magnesia, citric acid, tartaric acid, and bicarbonate of soda. It is given in doses of a teaspoonful, or more, as a mild purgative.

LIQUOR MAGNESIÆ CITRATIS—SOLUTION OF CITRATE OF MAGNESIA.

PREPARATION.—*Take of carbonate of magnesia,* 100 *grains; citric acid,* 200 *grains; syrup of lemons, half a fluid ounce; bicarbonate of potash, in crystals,* 40 *grains; water, a sufficiency. Dissolve the citric acid in two ounces of the water, and, having added the carbonate of magnesia, stir until it is dissolved. Filter the solution into a strong half-pint bottle, add the syrup and sufficient water to nearly fill the bottle, then introduce the bicarbonate of potash, and immediately close the bottle with a cork, which should be secured with string or wire. Afterwards shake the bottle until the bicarbonate of potash has dissolved.*

*Dose.*—Five to ten fluid ounces.

*Therapeutics.*—It is an agreeable and mild cooling saline cathartic.

## Group III. Metals of the Earths Proper—Aluminium and Cerium.

**ALUMINIUM** (Al = 27·5) is a brilliant white silver-like metal, malleable and ductile; it may be obtained from its chloride by heating with sodium, or from *cryolite*, which is a double fluoride of aluminium and sodium by the same process. Specific gravity, 2·6. It is the metallic base of alumina.

**Alumina** ($Ol_2O_3$) is the only recognised oxide of aluminium. It may be obtained from alum by adding to it an excess of ammonia, hydrate of alumina being precipitated; or by decomposing a solution of alum by an excess of carbonate of potash, washing it repeatedly, redissolving it in hydrochloric acid, and ultimately precipitating it by ammonia. Alumina is colourless, tasteless, inodorous, and insoluble in water, though it has a strong affinity for it. The salts of alumina are but feebly basic, and have all more or less an acid reaction.

**Alumen** ($NH_4Al(SO_4)_2 12H_2O$)—A sulphate of ammonia and alumina crystallized from solution in water. Alum—Ammonia Alum.

Alum is obtained from an argillaceous slaty rock, known as aluminous shale, slate, or rock, which consists of alumina in combination with a sulphide of iron. By exposure to the air, or by calcination, the iron and sulphur are oxidised, the former into oxide of iron, the latter into sulphuric acid, sulphates of alumina and iron being formed. From this compound the sulphate of iron is separated by solution and crystallization, and a salt of ammonia is added to the solution of sulphate of alumina, whereby the double sulphate of alumina and ammonia is obtained, which is purified by repeated solution and crystallization.

*Characters.*—In colourless transparent crystalline masses, exhibiting the faces of the regular octahedron, and having an acid sweetish astringent taste. Its aqueous solution gives with caustic potash or soda a white precipitate, soluble in an excess of the reagent, and the mixture evolves ammonia, especially when heated. The aqueous solution gives an immediate precipitate with chloride of barium.

ALUMEN EXSICCATUM—Dried Alum—Alumen Ustum.—*Take of alum,* 4 *ounces. Heat the alum in a porcelain dish, or other suitable vessel, till it liquefies, then raise and continue the heat, not allowing it to exceed* 400°, *till aqueous vapour ceases to be disengaged,* *and the salt has lost 47 per cent. of its weight. Reduce the residue to powder, and preserve it in a well-stoppered bottle.*

*Dose.*—Ten to thirty grains in solution, in pills, or as an electuary; as a gargle, sixty grains or more to eight ounces of liquid; as a lotion, sixty grains to half-an-ounce to a pint of liquid, or in the form of alum whey. Dried alum is used only externally.

*Therapeutics.*—Alum acts as an astringent and irritant in large doses, causing vomiting and purging; in larger it is an irritant poison, causing nausea, vomiting, abdominal pain, diarrhœa, and death. Internally, it has been recommended in colica pictonum in frequently repeated doses, and in lead poisoning as a chemical antidote; in chronic diarrhœa and dysentery, and in catarrhal affections of the stomach, in which there is hypersecretion of glairy mucus and a relaxed condition of the mucous membrane; in passive hæmatemesis and hæmoptysis; in chronic hooping-cough; as an emetic in croup; in gonorrhœa, combined with cubebs; in uterine hemorrhages, and in hæmaturia when the hemorrhage is from the bladder, &c. As a gargle, wash, or lotion, it has been used in the relaxed states of the mucous membrane of the mouth and throat with profuse secretion of mucus, in ulcerations of the mouth and throat, and sponginess of the gums, &c.; as a collyrium in purulent ophthalmia; as an injection in ulcerations of, growths in, and hemorrhages and discharges from, the vagina and uterus; in gonorrhœa, gleet, &c. Externally, it is applied either as a poultice, lotion, or the powder of burnt alum, to ulcers, chilblains, nævi, fungous granulations, gangrene, &c. In epistaxis it is injected into the nares; or plugs of lint, soaked in a saturated solution, are inserted; it is also applied as a hemostatic to leech bites, wounds, hemorrhoids, &c. By insufflation the powder of burnt alum is applied in diphtheria, inflammatory sore throat, &c.

**CERIUM** ($Ce=92$). Cerium is a rare metal, and its properties have not hitherto been well defined. Of its salts, the oxalate, $CeC_2O_4$, and the nitrate, $Ce2NO_3$, are used in medicine. The salts of cerium are supposed to resemble bismuth and nitrate of silver in their medicinal properties, and to act as sedatives and tonics. Only the oxalate, however, has been made officinal.

CERII OXALAS ($CeC_2O_4 3H_2O$)—The Oxalate of Cerium.

A salt which may be obtained as a precipitate by adding a solution of oxalate of ammonia to a soluble salt of cerium.

*Characters.*—A white granular powder, insoluble in water, decomposed at a dull red heat into a reddish-brown powder, which dissolves completely, and without effervescence, in boiling hydrochloric acid, and the resulting solution gives with solution of sulphate of potash a white crystalline precipitate. If the salt be boiled with solution of potash and filtered, the filtrate is not affected by solution of chloride of ammonium, but when supersaturated with acetic acid, it gives with chloride of calcium a white precipitate, which is soluble in hydrochloric acid. 10 grains when incinerated lose 5·2 grains in weight.

*Dose.*—One to two grains, usually in the form of pill.

*Therapeutics.*—The oxalate of cerium was recommended by Sir James Y. Simpson in the treatment of vomiting during the earlier period of pregnancy, in the chronic vomiting attending irritable dyspepsia, and in the vomiting of phthisis; in epilepsy, chorea, &c., it was supposed to act in these affections as a gastric sedative and nervine tonic.

GROUP IV. METALS PROPER—MANGANESE, IRON, COPPER, ZINC, CADMIUM, BISMUTH, LEAD, TIN, ANTIMONY, ARSENIC, MERCURY, SILVER, GOLD, PLATINUM.

## MANGANESIUM (Mn = 55).

**Manganesii Oxidum Nigrum** ($MnO_2$)—Black Oxide of Manganese—Peroxide of Manganese.

*Characters.*—A heavy black powder, which dissolves almost entirely in hydrochloric acid with the evolution of chlorine, and gives off oxygen when heated to redness. Used for producing chlorine.

Besides being employed in the preparation of Cl, it is used in the arts for various purposes, as, for example, to prepare oxygen. It is liable to certain impurities, its freedom from which is known by the quantity of oxygen it yields on heating. In doses of ten grains it is sometimes used to allay vomiting.

**Potassæ Permanganas** ($KMnO_4$)—Permanganate of Potash.

PREPARATION.—*Take of caustic potash, 5 ounces; black oxide of manganese, in fine powder, 4 ounces; chlorate of potash, 3½ ounces; diluted sulphuric acid, a sufficiency; distilled water, 2½ pints. Reduce the chlorate of potash to fine powder, and mix it with the oxide of manganese; put the mixture into a porcelain basin, and add to it the caustic potash, previously dissolved in four ounces of the water. Evaporate to dryness on a sand-bath, stirring diligently to prevent spurting. Pulverise the mass, put it into a covered Hessian or Cornish crucible, and expose it to a dull red heat for an hour, or till it has assumed the* *condition of a semifused mass. Let it cool, pulverise it, and boil with a pint and a-half of the water. Let the insoluble matter subside, decant the fluid, boil again with half-a-pint of the water; again decant, neutralise the united liquors accurately with the diluted sulphuric acid, and evaporate till a pellicle forms. Set aside to cool and crystallize. Drain the crystalline mass, boil it in six ounces of the water, and strain through a funnel, the throat of which is lightly obstructed by a little asbestos. Let the fluid cool and crystallize, drain the crystals, and dry them by placing them under a bell jar over a vessel containing sulphuric acid.*

*Characters.*—Dark purple slender prismatic crystals, inodorous, with a sweet astringent taste, soluble in water. A single small crystal suffices to form, with an ounce of water, a rich purple solution, which, when mixed with a little rectified spirit and heated, becomes yellowish-brown. The crystals heated to redness decrepitate, evolve oxygen gas, and leave a black residue, from which water extracts potash, recognised by its alkaline reaction, and by its giving, when acidulated with hydrochloric acid, a yellow precipitate with perchloride of platinum.

The readiness with which this salt yields its oxygen is its chief peculiarity and the cause of its medicinal value. When brought into contact with organic matter and deoxidising agents generally, it gives up a portion of its oxygen, loses its brilliant colour, and is converted into the yellowish-brown hydrated peroxide of manganese referred to in the *Characters.* A standard solution of the permanganate is used to determine the quantity of organic matter present in air and water, the quantity being in direct proportion to the loss of colour. The permanganate has been largely introduced as a deodoriser and disinfectant, under the title of *Condy's Disinfecting Fluid* and *Condy's Ozonised Water.*

LIQUOR POTASSÆ PERMANGANATIS—SOLUTION OF PERMANGANATE OF POTASH.—*Take of permanganate of potash,* 80 *grains; distilled water, one pint. Dissolve.*

*Dose.*—One to five grains, simply dissolved in distilled water, so as to avoid decomposition by organic matters, or two to four fluid drachms of the Liquor. Externally, as a caustic application, the powder may be sprinkled over sores, or strong solutions may be applied; as a purifying lotion or gargle, two or more drachms of the officinal solution in eight or ten ounces of distilled water. For purifying apartments, water-closets, &c., *Condy's Disinfecting Fluid,* which is about twice as strong, though less pure than the officinal solution, may be employed, exposed in open vessels, or sprinkled on the floor.

*Therapeutics.*—Permanganate of potash is chiefly used as an escharotic, disinfectant, antiseptic, and deodorising agent, for the cleansing of gangrenous, cancerous, and other foul ulcers and wounds; as a gargle and wash for the mouth and throat, in ulcerations with fetid discharges from these parts; as an injection in fetid discharges from the vagina, &c. It may be given internally as a deodoriser of the breath and sputa in cases of phthisis, gangrene of the lungs, &c.; and to purify the alvine dejections in dysentery, typhoid fever, &c. It is also extensively used as a deodoriser of sick-rooms, water-closets, cesspools, &c.

FERRUM (Fe=54)—Iron—the *Mars*, ♀, of the alchemists—was probably the first used of any of the minerals in medicine. It occurs largely both in the inorganic and organic worlds, both in the free state and combined in a variety of forms. Iron exists in the blood, and is believed to be an essential constituent of it, without which life could not be sustained; its presence in sufficient quantity being indicated by the ruddy appearance of the cheeks and lips in health, whilst a deficiency is marked by paleness and other symptoms of disease. As a remedy, iron is inert in the metallic state, and it is only when it is rendered soluble by oxidation and conversion into salts (either before its administration, or by the gastric fluid) that it becomes useful. The preparations of iron exercise a twofold action —one immediate or primary, the other secondary. Their immediate action, varying according to the preparations employed, and chiefly manifested by the persalts, is generally stimulant and astringent of the parts to which they are applied, stimulating the appetite and improving the digestion. The preparations which produce this effect are contra-indicated in those cases in which there is irritability of the stomach, with a tendency to constipation, both of which they would increase; but they are used advantageously in cases of hyper-secretions, passive hemorrhages, and the like. The secondary, the true chalybeate or hematinic, action of the ferruginous preparations is manifested slowly, after the medicine has been given in moderate doses for a considerable time, and consists in the enrichment of the blood by the increase in the number of its red particles. The function of iron in the blood appears to be as an oxidising agent, because under its administration the pulse is strengthened and quickened, the temperature is raised, and the amount of urea excreted is increased. The milder protosalts are commonly used for this purpose, because their employment is usually indicated in the cases of delicate females and children suffering from anæmia, scrofula, &c., whose stomachs are weak and irritable, and would not bear the stronger preparations. When employed in unsuitable cases, or when pushed too far, chalybeates are apt to cause uneasiness, by inordinately exciting the circulatory system, giving rise to general plethora, and a complaint on the part of the patient of fulness in the head, singing in the ears, throbbing in the temples, headache, and general feverish excitement; and when the astringent preparations are unduly exhibited, there may be uneasiness and pain in the stomach and bowels, possibly attended by vomiting and diarrhœa. Ferruginous preparations are contra-indicated in persons of plethoric habit of body, and in active inflammatory and hemorrhagic cases. They tend to constipation and to blacken the alvine evacuations, the latter of which circumstances, if unexplained, may cause uneasiness in the mind of the patient. The colour is due to the formation of tannate and sulphuret of iron, due to the combination of the iron with the tannin and sulphur obtained from the food and intestinal gases. When the ferruginous preparations are administered chiefly for the sake of their tonic and astringent properties, it is better to give them in moderate doses upon an empty stomach; but when given as chalybeates it is better to give them with food. Besides the conditions already adverted to, the ferruginous preparations are employed in dyspepsia; in heart disease; in affections of the urinary organs, liver, and spleen; in dropsies; in fevers, &c., the chief of which will be mentioned under the several preparations.

**Ferrum**—Iron. 1. Wrought Iron, in the form of wire or nails free from oxide. 2. Iron Filings. Iron filings may be procured from the blacksmith's shop; they may be obtained in a state of tolerable purity by means of a magnet, but even then they contain adherent impurities. The readiest method of procuring them uncontaminated is by filing a piece of clean wrought-iron over a sheet of paper. Iron filings are rarely used internally; but were formerly given for the cases in which the soluble preparations are now commonly administered.

**Ferrum Redactum**—Reduced Iron—Ferri Pulvis—Fer Réduit—Metallic Iron, with a variable amount of magnetic oxide of iron.

PREPARATION.—*Take of hydrated peroxide of iron,* 1 *ounce; zinc granulated, a sufficiency; sulphuric acid, a sufficiency; chloride of calcium, a sufficiency. Introduce the hydrated peroxide of iron into a* *gun-barrel, confining it to the middle part of the tube by plugs of asbestos. Pass the gun-barrel through a furnace, and when it has been raised to a strong red heat, cause it to be traversed by a stream of hydrogen gas developed by the action on the zinc of some of the sulphuric acid, diluted with eight times its volume of water. The gas, before entering the gun-barrel, must be rendered quite dry by being made to pass first through the remainder of the sulphuric acid, and then through a tube eighteen inches long, packed with small fragments of the chloride of calcium. The farther end of the gun-barrel is to be connected by a cork with a bent tube dipping under water; and when the hydrogen is observed to pass through the water at the same rate that it bubbles through the sulphuric acid, the furnace is to be allowed to cool down to the temperature of the atmosphere, the current of hydrogen still being continued. The reduced iron is then to be withdrawn, and enclosed in a dry stoppered bottle.*

*Characters.*—A fine greyish-black powder, strongly attracted by the magnet, and exhibiting metallic streaks when rubbed with firm pressure in a mortar. It dissolves in hydrochloric acid with the evolution of hydrogen, and the solution gives a light-blue precipitate with the yellow prussiate of potash.

*Therapeutics.*—This preparation is a pure chalybeate and hematinic. Very useful in anæmia, because it is tasteless and unirritating, and readily taken by children and by those of delicate stomach, it is dissolved in the stomach and so becomes active.

*Dose.*—Two to ten grains in powder or pill.

## Trochisci Ferri Redacti—Lozenges of Reduced Iron.

PREPARATION.—*Take of reduced iron,* 720 *grains; refined sugar, in powder,* 25 *ounces; gum acacia, in powder,* 1 *ounce; mucilage of gum acacia,* 2 *fluid ounces; distilled water,* 1 *fluid ounce, or a sufficiency. Mix the iron, sugar, and gum, and add the mucilage and water to form a proper mass. Divide into* 720 *lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains one grain of reduced iron.*

*Dose.*—One to six lozenges occasionally.

## Ferri Peroxidum Hydratum ($Fe_2O_3H_2O$) — Hydrated peroxide of iron.

PREPARATION.—*Take of moist peroxide of iron,* 1 *pound. Dry it at a temperature not exceeding* 212°, *until it ceases to lose weight. Then reduce it to fine powder.*

By this process all but one atom of the water of the humid peroxide is driven off.

*Characters.*—A reddish-brown powder, destitute of taste, and not magnetic, it dissolves completely, though slowly, with the aid of heat, in hydrochloric acid diluted with half its volume of water, and the solution gives a copious precipitate with the yellow, but none with the red prussiate of potash. Heated to dull redness in a test tube, it gives off moisture.

PREPARATION.—*Emplastrum Ferri.*

EMPLASTRUM FERRI—CHALYBEATE PLASTER—EMPLASTRUM ROBORANS.—*Take of hydrated peroxide of iron, in fine powder,* 1 *ounce; Burgundy pitch,* 2 *ounces; lead plaster,* 8 *ounces. Add the peroxide of iron to the Burgundy pitch and lead plaster, previously melted together, and stir the mixture constantly till it stiffens on cooling.*

*Dose.*—Twenty to sixty grains, or more, in powder or electuary; in may be given in the cases in which ferruginous tonics and chalybeates are indicated, but its use is chiefly confined to the treatment of neuralgia, especially tic-douloureux. The plaster is employed in lumbago, rheumatic pains, weak joints, &c., as a mechanical support, and to afford warmth.

**Ferri Peroxidum Humidum**—Moist peroxide of iron. Hydrated peroxide of iron, with about 86 per cent. of uncombined water.

PREPARATION.—*Take of solution of persulphate of iron,* 4 *fluid ounces; solution of soda,* 33 *fluid ounces; distilled water, a sufficiency. Mix the solution of persulphate of iron with a pint of the distilled water, and add this gradually to the solution of soda, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquor has drained away, wash the precipitate with distilled water, until what passes through the filter ceases to give a precipitate with chloride of barium. Lastly, enclose the precipitate without drying it in a stoppered bottle, or other suitable vessel, from which evaporation cannot take place. This preparation, when used, should be recently made.*

*Characters.*—A soft, moist, pasty mass, of a reddish-brown colour. Dissolves readily in diluted hydrochloric acid without the aid of heat, and the solution gives a copious blue precipitate with the yellow, but not with the red prussiate of potash. A little of it dried at 212°, until it ceases to lose weight, gives off moisture when heated to dull redness in a test tube.

*Therapeutics.*—Humid peroxide of iron is seldom given as a chalybeate, but may be substituted for the hydrated peroxide in doses of ten to thirty grains, or more. Its chief use is as an antidote in cases of arsenical poisoning. It must be given in large doses (a tablespoonful every few minutes), at least to the extent of twelve times the amount of the poison that has been swallowed ; and as it only takes effect upon arsenic in solution, it is essential to continue the antidote so long as there is any possibility of there being any undissolved poison in the stomach. It should be freshly made ; and when the materials for the above process are not at hand, the antidote may be expeditiously prepared by pouring the solution or tincture of perchloride of iron into solution of ammonia, potash, or soda, and filtering and washing the precipitate.

## **Ferri Oxidum Magneticum**—Magnetic Oxide of Iron.

PREPARATION.—*Take of solution of persulphate of iron,* 5½ *fluid ounces; sulphate of iron,* 2 *ounces; solution of soda,* 4 *pints; distilled water, a sufficiency. Dissolve the sulphate of iron in two pints of the water, and add to it the solution of persulphate of iron, then mix this with the solution of soda, stirring them well together. Boil the mixture, let it stand for two hours, stirring it occasionally, then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water, until what passes through the filter ceases to give a precipitate with chloride of barium. Lastly, dry the precipitate at a temperature not exceeding* 120°.

*Characters.*—Brownish-black, destitute of taste, strongly attracted by the magnet. It dissolves without effervescence in hydrochloric acid diluted with half its volume of water, and the solution thus obtained gives blue precipitates with the red and yellow prussiates of potash. When a small quantity is heated in a dry test-tube by the flame of a lamp, a deposit of moisture takes place in the cool part of the tube.

*Therapeutics.*—Magnetic oxide of iron may be administered as a mild chalybeate, but it is generally superseded by the *Fer réduit.*

*Dose.*—From three to twenty grains in powder or electuary.

## **Ferri Perchloridi Liquor Fortior**—Strong Solution of Perchloride of Iron.

PREPARATION.—*Take of iron wire,* 2 *ounces; hydrochloric acid,* 12 *fluid ounces; nitric acid,* 9 *fluid drachms; distilled water,* 8 *fluid ounces. Mix eight fluid ounces of the hydrochloric acid with the distilled water, and in this dissolve the iron at a gentle heat. Filter the* *solution, add to it the remainder of the hydrochloric acid and the nitric acid, heat the mixture briskly, until, on the sudden evolution of red fumes, the liquid becomes of an orange-brown colour, then evaporate by the heat of a water-bath until it is reduced to ten fluid ounces.*

*Characters.*—An orange-brown solution, with a strong styptic taste; miscible with water and rectified spirit in all proportions. Diluted with water, it is precipitated white by nitrate of silver and blue by yellow prussiate of potash, but not at all by red prussiate of potash.

LIQUOR FERRI PERCHLORIDI—Solution of the Perchloride of Iron.

The same strength as tincture of perchloride of iron.

PREPARATION.—*Take of strong solution of perchloride of iron,* 5 *fluid ounces; distilled water,* 15 *fluid ounces. Mix.*

*Dose.*—Ten to thirty minims.

*Therapeutics.*—This preparation is cheaper, keeps very much better, and possesses all the medicinal virtues of the tincture, with the exception of not being so powerful a local astringent or irritant. It ought, therefore, eventually to supersede the latter entirely.

TINCTURA FERRI PERCHLORIDI—TINCTURE OF PERCHLORIDE OF IRON. Tinctura Ferri Sesquichloridi—Tinctura Ferri Muriatis.—*Take of strong solution of perchloride of iron,* 5 *fluid ounces; rectified spirit,* 15 *fluid ounces. Mix, and preserve in a stoppered bottle.* TEST.—*Specific gravity,* 0·992. *This tincture has about one-third of the strength of Tinctura Ferri Sesquichloridi,* Dub.

*Dose.*—Of the strong solution, two to ten drops, well diluted; of the tincture or the solution, ten to forty drops, well diluted with water or syrup. For injecting into aneurisms, varices, or nævi, solutions of various strengths (five to twenty grains to a drachm of distilled water) are employed.

*Therapeutics.*—Both the solutions and the tincture of perchloride of iron act as powerful astringents, styptics, hemostatics, and tonics, and undiluted, as escharotics. In excessive doses the tincture has occasionally proved fatal, and frequently highly injurious, the symptoms and treatment resembling those of poisoning by hydrochloric acid. It has been criminally used to induce abortion. Liquor Ferri Perchloridi Fortior is rarely used internally, the tincture, which is one-fourth of its strength, being commonly employed, but it may safely be given in pregnancy and anæmia, in medicinal doses, as it has no direct action on the uterus. It has been proposed to treat aneurisms by injecting them with strong solutions of the perchloride of iron; but the practice is highly dangerous. Varicose veins, varicose ulcers, and nævi have been treated in a similar manner. As an escharotic and hemostatic, the strong solution is applied to ulcerated surfaces, hospital gangrene, cancerous and fungous ulcerations, uterine polypi, hemorrhoidal tumours, or a solution in glycerine to stop bleeding from oozing surfaces. In post-partum hæmorrhage its use has been strongly advocated by Dr. Barnes and others. But when so employed, it must be remembered that its use entails risk of embolism, or of metritis; so that it is only allowable in desperate cases. The *Tincture* is also used as a hemostatic, to arrest capillary hæmorrhage, to stop the bleeding of leech bites, and that following the extraction of teeth; and, as a milder caustic, it is applied to simple and venereal warts, to ulcerated surfaces, spongy granulations, ulcerated throat, diphtheria, &c. Internally, the tincture is one of the most frequently used preparations of iron; it is employed as a tonic and chalybeate, but it is also somewhat of a diuretic. It is used in relaxed and atonic states of the system when there is no irritability of the alimentary mucous membrane; in the night sweats and debility of phthisis; in passive hæmorrhages and mucous discharges from the genito-urinary organs, as in hæmaturia, leucorrhœa, gleet, &c.; also in the affections of the urinary organs, as in irritable bladder, spasmodic retention, and in the incontinence of children. In erysipelas the tincture is given in doses of fifteen to twenty-five minims, repeated every two or three hours. As a tonic and chalybeate, it is given in chlorosis, anæmia, albuminuria, diabetes, &c. The bowels must be relieved from the constipation which it produces.

## **Ferri Pernitratis Liquor**—Solution of Pernitrate of Iron.

PREPARATION.—*Take of fine iron wire, free from rust,* 1 *ounce; nitric acid,* 4½ *fluid ounces; distilled water, a sufficiency. Dilute the nitric acid with* 16 *ounces of the water, introduce the iron wire into the mixture, and leave them in contact until the metal is dissolved, taking care to moderate the action should it become too violent, by the addition of a little more distilled water. Filter the solution, and add to it as much distilled water as will make its bulk one pint and a-half.*

*Characters.*—A clear solution of a reddish-brown colour, slightly acid and astringent to the taste; gives a blue precipitate with the yellow prussiate of potash. When to a little of it placed in a test-tube half its volume of pure sulphuric acid is added, and then a solution of sulphate of iron is poured on, the whole assumes a dark-brown colour.

*Therapeutics.*—Ten to forty minims, sufficiently diluted with water. Pernitrate of iron acts as a tonic, astringent, and escharotic. It is given in chronic diarrhœa and in dysentery, both by the stomach and as an injection with mucilage of starch; in the colliquative diarrhœa and sweating of phthisis; in lienteric diarrhœa, in the diarrhœa of nervous, debilitated females; in passive hemorrhages from the stomach, intestines (especially if in the course of typhoid fever), uterus, urinary organs, or lungs; in chronic mucous discharges, &c., but is probably inferior to the liquor perchloride.

## Ferri Sulphas ($FeSO_47H_2O$)—Sulphate of Iron—Green Vitriol.

PREPARATION.—*Of Ferri Sulphas: Take of iron wire, 4 ounces; sulphuric acid, 4 fluid ounces; distilled water, 1½ pint. Pour the water on the iron placed in a porcelain dish, add the sulphuric acid, and when the disengagement of gas has nearly ceased, boil for ten minutes. Filter now through paper, and, after the lapse of twenty-four hours, separate the crystals which have been deposited from the solution. Let these be dried on filtering paper placed on porous bricks, and preserved in a stoppered bottle.*

## Ferri Sulphas Granulata.

PREPARATION.—*Take of iron wire, 4 ounces; sulphuric acid, 4 fluid ounces; distilled water, 1½ pint; rectified spirit, 8 fluid ounces. Pour the water on the iron placed in a porcelain capsule, add the sulphuric acid, and when the disengagement of gas has nearly ceased, boil for ten minutes, and then filter the solution into a jar containing the spirit, stirring the mixture so that the salt shall separate in minute granular crystals. Let these, deprived by decantation of adhering liquid, be transferred on filtering paper to porous tiles, and dried by exposure to the atmosphere. They should be preserved in a stoppered bottle.*

*Characters.*—Of Ferri Sulphas: In oblique rhombic prisms, of a pale greenish-blue colour and styptic taste; insoluble in rectified spirit, soluble in water.

*Characters.*—Of Ferri Sulphas Granulata: In small granular crystals of a pale greenish-blue colour. In other respects corresponds to characters and tests for sulphate of iron.

FERRI SULPHAS EXSICCATA—DRIED SULPHATE OF IRON—($FeSO_4H_2O$).—*Take of sulphate of iron, 4 ounces. Expose it in a* *porcelain or iron dish to a heat commencing at 212°, but which may be finally raised to 400°, until aqueous vapour ceases to be given off. Reduce the residue to a fine powder, and preserve it in a stoppered bottle.* The sulphate loses six of its seven atoms of water by this process. The dried sulphate occurs as a yellowish-white powder, and is much less bulky than the sulphate.

*Dose.*—Of the sulphate, or granulated sulphate, one to five grains, in pill or solution; of the dried sulphate, half-a-grain to two or three grains.

## **Pilula Aloes et Ferri**—Pill of Aloes and Iron.

PREPARATION.—*Take of sulphate of iron,* 1½ *ounce; Barbadoes aloes, in powder,* 2 *ounces; compound powder of cinnamon,* 3 *ounces; confection of roses,* 4 *ounces. Reduce the sulphate of iron to powder, rub it with the aloes and compound powder of cinnamon, and, adding the confection, make the whole into a uniform mass.*

*Dose.*—Five to ten grains.

*Therapeutics.*—This mass combines the purgative properties of the aloes with the chalybeate of the iron, the latter ingredient seeming to increase the action of the aloes. It is useful as an emmenagogue in atonic amenorrhœa and chlorosis, and as a purgative in anæmia in general.

Sulphate of iron in excessive doses may act as an irritant poison; and it has been used criminally to produce abortion; in large medicinal doses it may cause irritability of stomach. It acts as a tonic, astringent, hematinic, hemostatic, &c., and is given in those cases in which both the tonic and true chalybeate effects of iron are required, as in anæmia, chlorosis, and general debility; in passive hemorrhages, profuse discharges, chronic diarrhœa, &c.; and in neuralgia; and it is given in enlargement of the spleen. Externally, in the form of lotion, the sprinkled powder, or ointment, it is applied to ulcerated surfaces, chronic ophthalmia, erysipelas, &c. As an injection, it is used in leucorrhœa, gleet, prolapse of the rectum, &c.

## **Liquor Ferri Persulphatis**—Solution of the Persulphate of Iron—Solution of Ferric Sulphate.

PREPARATION.—*Take of sulphate of iron,* 8 *ounces; sulphuric acid and nitric acid, of each,* 6 *fluid drachms; distilled water,* 12 *fluid ounces, or a sufficiency. Add the sulphuric acid to* 10 *ounces of the water, and dissolve the sulphate of iron in the mixture with the aid of heat. Mix the nitric acid with the remaining* 2 *ounces of the water, and add the dilute acid to the solution of sulphate of iron. Concentrate* *the whole by boiling, until, by the sudden disengagement of ruddy vapours, the liquid ceases to be black, and acquires a red colour. A drop of the solution is now to be tested with red prussiate of potash; and if a blue precipitate forms, a few additional drops of nitric acid should be added, and the boiling renewed, in order that the whole of the sulphate may be converted into persulphate of iron. When the solution is cold, make the quantity* 11 *fluid ounces, by the addition, if necessary, of distilled water.*

*Characters.*—A dense solution of a dark-red colour, inodorous and very astringent, miscible in all proportions with alcohol and water.

*Therapeutics.*—This preparation is not used internally, but is employed in forming the following compounds:—Ferri et Ammoniæ Citras; Ferri et Quiniæ Citras; Ferri Oxidum Magneticum; Ferri Peroxidum Humidum; Ferrum Tartaratum; Tinctura Ferri Acetatis.

**Ferri Carbonas Saccharata**—Saccharated Carbonate of Iron—Carbonate of Iron (or $FeCO_3$) mixed with Peroxide of Iron and Sugar, and forming at least thirty-seven per cent. of the mixture.

PREPARATION.—*Take of sulphate of iron,* 2 *ounces; carbonate of ammonia,* 1¼ *ounce; boiling distilled water,* 2 *gallons; refined sugar,* 1 *ounce. Dissolve the sulphate of iron and the carbonate of ammonia each in half-a-gallon of the water, and mix the two solutions with brisk stirring in a deep cylindrical vessel, which is then to be covered as accurately as possible. Set the mixture by for twenty-four hours, and from the precipitate which has subsided, separate the supernatant solution by a siphon. Pour on the remainder of the water, stir well, and after subsidence, again remove the clear solution. Collect the resulting carbonate on a calico filter, and, having first subjected it to expression, rub it with the sugar in a porcelain mortar. Finally, dry the mixture at a temperature not exceeding* 212°.

*Characters.*—Small coherent lumps of a grey colour, with a sweet, very feeble chalybeate taste. Dissolves, with effervescence, in warm hydrochloric acid, diluted with half its volume of water.

MISTURA FERRI COMPOSITA—COMPOUND MIXTURE OF IRON—GRIFFITH'S MIXTURE.—*Take of sulphate of iron,* 25 *grains; carbonate of potash,* 30 *grains; myrrh and refined sugar, of each,* 6( *grains; spirit of nutmeg,* 4 *fluid drachms*; *rose water,* 9½ *flui ounces. Reduce the myrrh to powder, add the carbonate of potash an sugar, and triturate them with a small quantity of the rose water, so to form a thin paste; then gradually add more rose water and the spi of nutmeg, continuing the trituration and further addition of* *water until about eight fluid ounces of a milky liquid is formed. Then add the sulphate of iron dissolved in the remainder of the rose water, mix them together thoroughly, and preserve the mixture as much as possible from contact with the air.*

PILULA FERRI CARBONATIS—PILL OF CARBONATE OF IRON. —*Take of saccharated carbonate of iron,* 1 *ounce; confection of roses,* ½ *ounce. Beat them into a uniform mass.*

*Dose.*—Of the saccharated carbonate, in powder or electuary, five to thirty grains; of the compound mixture, an ounce to two ounces; of the pill, five to twenty grains.

*Therapeutics.*—Carbonate of iron acts as a mild non-astringent chalybeate, suitable for females and children. It resembles the peroxide in medicinal properties, and, like it, is useful in neuralgia. Griffith's mixture is largely used in anæmia, chlorosis, and amenorrhœa, &c. The myrrh and nutmeg render it somewhat stimulant. Carbonate of iron, held in solution by excess of carbonic acid, is the chief constituent of many chalybeate waters; on the escape of the dissolving carbonic acid, the carbonate is resolved into sesquioxide, which gives the ochry appearance to the soil in the vicinity of these springs.

**Ferri Phosphas**—Phosphate of Iron—Blue Phosphate of Iron —($Fe_3P_2O_8$) partially oxidated.

PREPARATION.—*Take of sulphate of iron,* 3 *ounces; phosphate of soda,* 2½ *ounces; acetate of soda,* 1 *ounce; boiling distilled water,* 4 *pints. Dissolve the sulphate of iron in one-half of the water, and the phosphate and acetate of soda in the remaining half. Mix the two solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with hot distilled water, till the filtrate ceases to give a precipitate with chloride of barium. Finally, dry the precipitate at a temperature not exceeding* 120°.

*Characters.*—A slate-blue amorphous powder, insoluble in water, soluble in hydrochloric acid. The solution yields a precipitate with both the yellow and red prussiate of potash, that afforded by the latter being the more abundant, and when treated with tartaric acid and an excess of ammonia, and subsequently with the solution of ammonio-sulphate of magnesia, lets fall a crystalline precipitate.

SYRUPUS FERRI PHOSPHATIS—SYRUP OF PHOSPHATE OF IRON.—*Take of granulated sulphate of iron,* 224 *grains; phosphate of soda,* 200 *grains; acetate of soda,* 74 *grains; diluted phosphoric acid,* 5½ *fluid ounces; refined sugar,* 8 *ounces; distilled water,* 8 *fluid ounces. Dissolve the sulphate of iron in four ounces of the water, and the phos-*

*phate and acetate of soda in the remainder; mix the two solutions, and, after careful stirring, transfer the precipitate to a calico filter, and wash it with distilled water till the filtrate ceases to be affected by chloride of barium. Then press the precipitate strongly between folds of bibulous paper, and add to it the diluted phosphoric acid. As soon as the precipitate is dissolved, filter the solution, add the sugar, and dissolve without heat. The product should measure exactly twelve fluid ounces. It contains one grain of phosphate of iron,* $3FeO,PO_5$, or $Fe_3P_2O_8$, *in* 1 *fluid drachm.*

*Dose.*—Of the powder, three to ten grains, in powder or pill, or dissolved in diluted phosphoric acid, sufficiently diluted; of the syrup, from twenty minims to a drachm, well diluted, each drachm containing one grain of phosphate of iron, and about half-a-drachm of diluted phosphoric acid.

*Therapeutics.*—Phosphate of iron has been recommended as a mild chalybeate, and is said to be useful, in consequence of its combination with phosphoric acid, in cases of anæmia, chlorosis, &c., in conjunction with scrofula and rickets; in cases complicated with great nervous exhaustion and depression of spirits, and where there is a tendency to deposits of phosphates in the urine; it has also been recommended in diabetes; but it is simply useful as a preparation of iron and not of phosphorus, the latter being only active in its elemental form and not as prosphoric acid, at least as a nervous tonic, or to promote the growth of the bony skeleton (WEGNER). Several phosphates have been used in medicine, and a variety of syrups have been prepared, such as syrup of the phosphate of iron and lime, syrup of the phosphate of iron and ammonia, syrup of pyrophosphate of iron, syrup of superphosphate of iron, &c. Parrish's compound syrup of phosphates contains, in a tea-spoonful, two and a-half grains of phosphate of lime, one grain of phosphate of iron, with parts of a grain of phosphates of soda and potash, in addition to free phosphoric and hydrochloric acids. This and the above syrups may be given in doses of from thirty drops to a teaspoonful.

### Ferrum Tartaratum ($KFeC_4H_4O_7$)—Tartarated Iron.

PREPARATION.—*Take of solution of persulphate of iron,* 5½ *fluid ounces; solution of ammonia,* 10 *fluid ounces; acid tartrate of potash, in powder,* 2 *ounces; distilled water, a sufficiency. Mix the solution of ammonia with three pints of distilled water, and to this add gradually the solution of persulphate of iron, previously diluted with two pints of distilled water, stirring constantly and briskly. Let the mixture* *stand for two hours, stirring it occasionally; then put it on a calico filter; and when the liquor has drained away, wash the precipitate with distilled water until that which passes through the filter ceases to give a precipitate with chloride of barium. Mix the washed and drained precipitate intimately with the acid tartrate of potash in a porcelain dish, and let the mixture stand for twenty-four hours; then, having applied a gentle heat, not exceeding* 140°, *add gradually a pint of distilled water, and stir constantly until nothing more will dissolve. Filter, evaporate, at a temperature not exceeding* 140°, *to the consistence of syrup, and dry it in thin layers, on flat porcelain or glass plates, in a drying-closet at* 120°. *Remove the dry salt in flakes, and keep it in stoppered bottles.*

*Characters.*—Thin transparent scales, of a deep garnet colour, slightly sweetish and astringent in taste, soluble in water, and sparingly soluble in spirit. The aqueous solution, when acidulated with hydrochloric acid, gives a copious blue precipitate with the yellow, but none with the red prussiate of potash. When the salt is boiled with a solution of soda, peroxide of iron separates, but no ammonia is evolved, and the filtered solution, when slightly acidulated by acetic acid, gives, as it cools, a crystalline deposit.

VINUM FERRI—WINE OF IRON.—*Take of fine iron wire (about No.* 35), 1 *ounce; sherry,* 1 *pint. Macerate for thirty days in a closed vessel, the iron being almost but not quite wholly immersed in the wine, and the vessel frequently shaken and the stopper removed; then filter.*

*Dose.*—Of the salt, five to fifteen grains, in solution or electuary; of the wine, one to four fluid drachms.

*Therapeutics.*—Tartarated iron acts as a mild chalybeate and tonic, and somewhat as a diuretic. It is given to delicate females and children.

## **Ferri et Ammoniæ Citras** ($NH_4FeHC_6H_5O_8H_2O$)—Citrate of Iron and Ammonia—Ammonio-Citrate of Iron.

PREPARATION.—*Take of solution of persulphate of iron,* 8 *fluid ounces; solution of ammonia,* 19½ *fluid ounces; citric acid,* 4 *ounces; distilled water, a sufficiency. Mix fourteen fluid ounces of the solution of ammonia with two pints of distilled water, and to this add gradually the solution of persulphate of iron, previously diluted with two pints of distilled water, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally; then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water until that which passes through the filter ceases to give a* *precipitate with chloride of barium. Dissolve the citric acid in eight ounces of distilled water, and, having applied the heat of a water-bath, add the oxide of iron, previously well drained, and stir them together until the whole or nearly the whole of the oxide has dissolved. Let the solution cool; then add five and a-half fluid ounces of solution of ammonia. Filter through flannel; evaporate to the consistency of syrup, and dry it in thin layers, on flat porcelain or glass plates, at a temperature not exceeding* 100°. *Remove the dry salt in flakes, and keep it in a stoppered bottle.*

*Characters.*—In thin transparent scales of a deep red colour, slightly sweetish and astringent in taste; it feebly reddens litmus paper, is soluble in water, but almost insoluble in rectified spirit. Heated with solution of potash, it evolves ammonia and deposits peroxide of iron. The alkaline solution from which the iron has separated does not, when slightly supersaturated with acetic acid, give any crystalline deposit.

*Dose.*—Three to eight grains, in solution.

*Therapeutics.*—Citrate of iron and ammonia acts as a mild non-astringent chalybeate, given to delicate females and children.

**Vinum Ferri Citratis**—Wine of the Citrate of Iron.

PREPARATION.—*Take of citrate of iron and ammonia,* 160 *grains; orange wine,* 1 *pint; dissolve, and let the solution remain for three days in a closed vessel, shaking it occasionally; afterwards filter.*

*Therapeutics.*—An excellent chalybeate, much less likely to decompose than the Vinum Ferri.

*Dose.*—One to four fluid drachms.

FERRI ET QUINIÆ CITRAS—Citrate of Iron and Quinia—Citric Acid combined with Peroxide of Iron, Protoxide of Iron, and Quinia.

PREPARATION.—*Take of solution of persulphate of iron,* 4½ *fluid ounces; sulphate of quinia,* 1 *ounce; diluted sulphuric acid,* 12 *fluid drachms; citric acid,* 3 *ounces; solution of ammonia, distilled water, of each, a sufficiency. Mix eight fluid ounces of the solution of ammonia with two pints of distilled water, and to this add the solution of persulphate of iron, previously diluted with two pints of distilled water, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally. Then put it on a calico filter, and when the liquid has drained away, wash the precipitate with distilled water until that which passes through the filter ceases to give a precipitate* *with chloride of barium. Mix the sulphate of quinia with eight ounces of distilled water, add the diluted sulphuric acid, and when the salt is dissolved, precipitate the quinia with a slight excess of solution of ammonia. Collect the precipitate on a filter, and wash it with a pint and a-half of distilled water. Dissolve the citric acid in five ounces of distilled water, and having applied the heat of a water-bath, add the oxide of iron, previously well drained; stir them together, and when the oxide has dissolved, add the precipitated quinia, continuing the agitation until this also has dissolved. Let the solution cool, then add, in small quantities at a time, twelve fluid drachms of solution of ammonia, diluted with two fluid ounces of distilled water, stirring the solution briskly, and allowing the quinia, which separates with each addition of ammonia, to dissolve before the next addition is made. Filter the solution evaporated to the consistence of a thin syrup, then dry it in thin layers on flat porcelain or glass plates, at a temperature of* 100°. *Remove the dry salt in flakes, and keep it in a stoppered bottle.*

*Characters.*—Thin scales of a greenish golden-yellow colour, somewhat deliquescent, and entirely soluble in cold water. The solution is very slightly acid, and is precipitated reddish-brown by solution of soda, white by solution of ammonia, blue by the yellow and red prussiates of potash, white and greyish-black by tannic acid.

*Dose.*—Three to eight or ten grains. The citrate of iron and quinia acts, in the double capacity of its united constituents, as a non-astringent chalybeate and tonic. It is not, however, a very satisfactory preparation, as it does not always contain its proper proportion of quinine.

### **Tinctura Ferri Acetatis**—Tincture of the Acetate of Iron.

PREPARATION.—*Take of solution of persulphate of iron,* 2½ *fluid ounces; acetate of potash,* 2 *ounces; rectified spirit, a sufficiency. Dissolve the acetate of potash in ten fluid ounces, and add the persulphate of iron to eight fluid ounces of the spirit, then mix the two solutions in a two-pint bottle and shake them well together, repeating the agitation several times during an hour. Put the tincture, with the precipitated salt contained in it, upon a filter, and when the liquid has ceased to run through, put as much rectified spirit upon the filter as will make the filtered product measure one pint.*

*Therapeutics.*—A ferruginous tonic and chalybeate. It is introduced from the Dublin Pharmacopœia. It is questionable whether its special merits are such as entitle it to a place in the Pharmacopœia, which is already so rich in chalybeate preparations.

*Dose.*—Five to thirty minims.

## Mistura Ferri Aromatica—Aromatic Mixture of Iron.

PREPARATION.—*Take of pale cinchona bark, in powder, 1 ounce; calumba root, in coarse powder, ½ ounce; cloves, bruised, ¼ ounce; fine iron wire, ½ ounce; compound tincture of cardamoms, 3 fluid ounces; tincture of orange peel, ½ fluid ounce; peppermint water, a sufficiency. Macerate the cinchona bark, calumba root, cloves, and iron, with twelve fluid ounces of the peppermint water, in a closed vessel for three days, agitating occasionally; then filter the liquid, adding as much peppermint water to the filter as will make the product measure twelve and a half fluid ounces; to this add the tinctures, and preserve in a well-stoppered bottle.*

*Dose.*—One to two fluid ounces.

*Therapeutics.*—This is a somewhat unchemical and unsightly preparation, but enjoys a great reputation in Dublin as an excellent tonic and chalybeate. From the name of its author, as well as on account of its appearances, it is sometimes called Heberden's Ink; but it contains such a small quantity of iron, that, medicinally, it can only be considered a tonic and stomachic.

**CUPRUM** ($Cu = 64$)—Copper—the *Venus*, ♀ of the alchemists—was known in the early ages. Copper, which derives its name from the island of Cyprus, or Κύπρος, where it was first wrought by the Greeks, occurs both in the inorganic and the organic world; in the latter it is found in the ashes of many plants, and in the former it is met with in various states of combination, especially in the form of sulphides, from which the copper of commerce is chiefly derived. Fine copper wire is contained in the Pharmacopœia, and copper foil—pure metallic copper, thin and bright—is placed in the Appendix. It is a red lustrous metal, malleable and ductile; it emits a peculiar odour when warmed or rubbed, and has an average specific gravity of 8·873. Copper in the metallic state is probably inert in the system, but when rendered soluble, either by previous preparation or by the action of the gastric fluid, it operates in large quantity as an irritant poison, and even in smaller doses it causes considerable gastro-intestinal irritation. Hence, the soluble salts of copper in over-doses are poisonous, whilst in medicinal quantities they are chiefly tonics and astringents, and also alteratives and antispasmodics.

## Cupri Sulphas ($CuSO_4 5H_2O$)—Sulphate of Copper—Blue Stone—Blue Vitriol.

PREPARATION.—*May be obtained by heating sulphuric acid and copper together, dissolving the soluble product in hot water and evaporating the solution until crystallization takes place on cooling.*

*Characters.*—A blue crystalline salt, in oblique prisms, soluble in water, forming a pale blue solution which strongly reddens litmus. The aqueous solution gives with chloride of barium a white precipitate, insoluble in hydrochloric acid, and a maroon-red precipitate with yellow prussiate of potash.

*Dose.*—As an astringent and tonic, a quarter of a grain to two grains in pill or solution; as an emetic, three to ten or fifteen grains, in solution; as a collyrium, one or two grains to an ounce of rose water; as an injection, two to five grains to an ounce of water; as a lotion, two to ten grains to an ounce of water.

*Therapeutics.*—Sulphate of copper in over-doses acts as an irritant poison, and as such it has been used for criminal purposes. Poisoning may take place either rapidly by a large dose, or more slowly by small and long-continued doses. The symptoms of acute poisoning are divisible into two classes; *first*, those proceeding from the immediate or topical effects of the drug; and, *second*, those arising after its absorption. The primary symptoms are developed within a few minutes of the swallowing of the poison; there is a nauseating, metallic, styptic taste, constriction of the throat and œsophagus, burning and colicky pains in the stomach and bowels, with painful distention of the abdomen and tenesmus; there is usually violent vomiting, and there may be diarrhœa, the vomited matters being of a blue or green colour, and the alvine evacuations sometimes greenish, and at other times darker coloured, with an admixture of blood. There is intolerance of pressure upon the abdomen; the urine is frequently suppressed, and occasionally jaundice has supervened. The secondary symptoms are occasioned by the effects of the poison upon the nervous system; there is general prostration of strength; the pulse is small, weak, frequent, and often irregular; the extremities are cold and trembling, and the face and body are bathed in a cold perspiration; the breathing is hurried and sighing; the patient suffers from intense thirst, headache, and cramps, and gradually sinks into a state of stupor, with or without convulsive attacks. Chronic poisoning by sulphate of copper, or by other preparations of copper, is manifested by the peculiar metallic styptic taste, hot skin, or alternations of heat and cold, thirst, loss of appetite, weariness, gradual emaciation, irritability of stomach, with nausea, and occasionally vomiting of greenish matters, colicky pains in the abdomen which is intolerant of pressure, trembling of the limbs and cramps, diarrhœa, with greenish evacuations, which are occasionally mixed with blood, a small pulse, nervous prostration, a tendency to paralysis, occasionally jaundice, &c. There is said to be also a characteristic purple line round the gums, but in a number of workmen in the metal, examined by the London Clinical Society, a green line was found on the teeth of all but two or three, but there was no blue line on the gums of any of them. Chronic poisoning by copper may occur from the use of copper vessels in the preparation of food; this, however, cannot take place when they are kept clean, but when allowed to stand with acidulous or fatty substances in them, the copper is dissolved, and being oxidised by the atmosphere, becomes poisonous. Treatment, albumen, as white of egg, or wheaten flour, sugar, encourage vomiting by giving plenty of warm water, or the stomach pump may be used. Subsequent symptoms to be treated as they arise. Medicinally, sulphate of copper acts as an astringent and tonic; as an emetic; as a styptic; and as an escharotic. It has been recommended in chronic dysentery and diarrhœa, in the diarrhœa of phthisis, and in that attending ulceration of the bowels; it is given in small doses in combination with small quantities of opium. In epilepsy, chorea, hysteria, &c., it has been given in small doses long continued, but in these affections its use is now generally abandoned as its action on the nervous system in medicinal doses is extremely doubtful. As an emetic it acts promptly, and without causing depression of the vital powers; when given in large doses for this purpose, and not ejected, its removal should be insisted upon by other means of producing vomiting, so as to avoid its irritating effects. As an antidote for phosphorus poisoning (BAMBERGER) as it forms an insoluble black phosphate of copper. Give 3 grains in solution every few minutes until vomiting occurs. As a wash, or in the form of a honey, it is applied to ulcerations of the mouth; as a gargle to ulcerated sore throat; as an injection, it is used in leucorrhœa and gonorrhœa; as a collyrium, it is applied to purulent ophthalmia, &c.; as a lotion to certain skin diseases; as an escharotic, it is applied to exuberant and unhealthy granulations, to indolent ulcers, to remove venereal warts, &c.

**ZINCUM** ($Zn=65$) is a bluish-white, lustrous, and rather hard metal, commonly of the specific gravity 6·8. It is soluble in hydrochloric and sulphuric acids, and in strong-heated solutions of potash and soda, with the evolution of hydrogen. Metallic zinc may be obtained from the native sulphide or carbonate.

ZINCUM GRANULATUM—GRANULATED ZINC.—*Take of zinc of commerce,* 1 *pound; fuse it in an earthen crucible, heated to a sufficient but not excessive degree in a suitable fire, and pour the fused metal in a thin stream into a vessel containing two gallons of cold water. Remove the granulated zinc from the water, and dry it.*

Granulated zinc is used in pharmacy.

## Zinci Oxidum ($ZnO$)—Oxide of Zinc—Flowers of Zinc.

PREPARATION.—*Take of carbonate of zinc,* 6 *ounces. Place the carbonate of zinc in a loosely-covered Hessian crucible, and expose it to a dull red heat, until a portion, taken from the centre of the contents of the crucible and cooled, no longer effervesces when dropped into diluted sulphuric acid. Let the crucible cool, and transfer the product to stoppered bottles.*

*Characters.*—A soft, nearly white, tasteless and inodorous powder, becoming pale-yellow when heated.

UNGUENTUM ZINCI — OINTMENT OF ZINC — Ointment of Oxide of Zinc.—*Take of oxide of zinc,* 80 *grains; benzoated lard,* 1 *ounce. Add the oxide of zinc to the benzoated lard, previously melted with a gentle heat, and stir the mixture constantly while it cools.*

*Dose.*—Two to ten or more grains, in powder or pill.

*Therapeutics.*—Oxide of zinc is employed as a tonic, antispasmodic, and astringent. It is slow of action as a tonic, and must, therefore, be long continued. It has been given in epilepsy, chorea, neuralgia, intermittent fever, hooping-cough, and the convulsions of children, in gastrodynia, &c., as a tonic astringent in the colliquative sweats of phthisis. It is sometimes used as an injection in leucorrhœa and in gonorrhœa. As an astringent application, as a powder, or mixed with starch, or better, in the form of ointment, it is applied to sore nipples, excoriations, bed-sores, ophthalmia tarsi, and to a variety of skin diseases, especially those of an eczematous or impetiginous character, after the acute symptoms have somewhat subsided.

## Zinci Chloridum ($ZnCl_2$)—Chloride of Zinc—Butter of Zinc.

PREPARATION.—*Take of granulated zinc,* 16 *ounces; hydrochloric acid,* 44 *fluid ounces; solution of chlorine, a sufficiency; carbonate of zinc,* ½ *ounce, or a sufficiency; distilled water,* 1 *pint. Put the zinc into a porcelain basin, add by degrees the hydrochloric acid previously mixed with the water, and aid the action by gently warming it on a sand-bath until gas is no longer evolved. Boil for half-an-hour, supplying the water lost by evaporation, and allow it to stand on a cool part* *of a sand-bath for twenty-four hours, stirring frequently. Filter the product into a gallon bottle, and pour in the solution of chlorine by degrees, with frequent agitation until the fluid acquires a permanent odour of chlorine. Add the carbonate of zinc, in small quantities at a time, and with renewed agitation, until a brown sediment appears. Filter through paper into a porcelain basin, and evaporate until a portion of the liquid, withdrawn on the end of a glass rod and cooled, forms an opaque white solid. Pour it out now into proper moulds, and when the salt has solidified, but before it has cooled, place it in closely-stoppered bottles.*

*Characters.*—Colourless opaque rods or tablets, very deliquescent and caustic; soluble almost entirely in water, alcohol, and ether. The watery solution is precipitated white by sulphide of ammonium and nitrate of silver; but, if first acidulated with hydrochloric acid, it is not affected by sulphuretted hydrogen.

LIQUOR ZINCI CHLORIDI—SOLUTION OF THE CHLORIDE OF ZINC—Sir William Burnett's disinfecting fluid.

PREPARATION.—*Take of granulated zinc,* 1 *pound; hydrochloric acid,* 44 *fluid ounces; solution of chlorine, a sufficiency; carbonate of zinc,* ½ *ounce, or a sufficiency; distilled water,* 1 *pint. Mix the hydrochloric acid and water in a porcelain dish, add the zinc, and apply a gentle heat to promote the action until gas is no longer evolved. Boil for half-an-hour, supplying the water lost by evaporation, and allow the product to cool. Filter it into a bottle, and add solution of chlorine by degrees, with frequent agitation, until the fluid acquires a permanent odour of chlorine. Add the carbonate of zinc, in small quantities at a time, and with renewed agitation, until a brown sediment appears. Filter the liquid into a porcelain basin, and evaporate until it is reduced to the bulk of two pints.*

*Dose.*—Half-a-grain to two or three grains, well diluted (rarely used).

*Therapeutics.*—Chloride of zinc, in the form of Sir William Burnett's disinfecting fluid, is sometimes taken by accident. It acts powerfully and fatally, producing the symptoms of a corrosive irritant poison. Antidotes, albumen, magnesia, chalk, carbonate of soda, and emetics. Medicinally, the chloride is but seldom given internally, but has been employed as a nervine tonic. It acts as a deeply-penetrating and powerful escharotic, destroying the part and causing great pain, which lasts for several hours. It may be applied in a thin layer in the form of a paste (made with flour, plaster of Paris, or gypsum), which may be left in contact with the part for several hours, a poultice being applied soon after its application. The neighbouring parts must be well protected. It is applied to ulcerated surfaces, not only with the view of removing morbid tissues, but also to bestow a healthy condition upon the parts immediately beneath the eschar; it is used in cancer, lupus, and a variety of callous and indolent ulcers, morbid growths, &c. It has been employed also to destroy nævi, and to arrest the pain of toothache; for which latter purpose, the cavity of the tooth having been cleaned out, a piece of wax, or lint, dipped in a mixture of the chloride and flour or plaster of Paris, is inserted, care being taken to protect the surrounding tissues. It is also used as an injection in gonorrhœa, and as a collyrium in gonorrhœal ophthalmia; in both cases it requires cautious application, of the strength of half-a-grain or a grain to the ounce of water.

### **Zinci Carbonas** ($ZnCO_3 (ZnO)_2 3H_2O$)—Carbonate of Zinc.

PREPARATION.—*Take of sulphate of zinc,* 10 *ounces; carbonate of soda,* 10½ *ounces; boiling distilled water, a sufficiency. Dissolve the carbonate of soda with a pint of the water in a capacious porcelain vessel, and pour into it the sulphate of zinc also dissolved in a pint of the water, stirring diligently. Boil for fifteen minutes after effervescence has ceased; and let the precipitate subside. Decant the supernatant liquor, pour on the precipitate three pints of boiling distilled water, agitating briskly; let the precipitate again subside, and repeat the processes of affusion of hot distilled water and subsidence, till the washings are no longer precipitated by chloride of barium. Collect the precipitate on calico, let it drain, and dry it with a gentle heat.*

*Characters.*—White, tasteless, inodorous, insoluble in water; soluble, with effervescence and without residue, in diluted nitric acid.

*Therapeutics.*—Carbonate of zinc is but little employed, its actions, uses, and doses being the same as the oxide of zinc. Its chief employment is as a desiccant and astringent application to abrasions, ulcerations, and cutaneous diseases.

### **Zinci Acetas** ($Zn(C_2H_3O_2)_2H_2O$)—Acetate of Zinc.

PREPARATION.—*Take of carbonate of zinc,* 2 *ounces; acetic acid,* 5 *fluid ounces, or a sufficiency; distilled water,* 6 *fluid ounces. Add the carbonate of zinc in successive portions to three ounces of the acetic acid previously mixed with the water in a flask; heat gently, add by degrees the remainder of the acid till the carbonate is dissolved; boil for a few minutes, filter while hot, and set it aside for two days to crystallize.*

*Decant the mother liquor; evaporate to one-half, and again set it aside for two days to crystallize. Place the crystals in a funnel to drain, then spread them on filtering paper on a porous tile, and dry them by exposure to the air at ordinary temperatures.*

*Characters.*—Thin, translucent, and colourless crystalline plates, of a pearly lustre, with a sharp, unpleasant taste, evolving acetic acid when decomposed by sulphuric acid; soluble in water and the solution precipitated pure white by sulphuretted hydrogen.

*Dose.*—One to five grains, in pill or solution; as a lotion or injection, three to ten or twenty grains to an ounce of water; or as an ointment.

*Therapeutics.*—Acetate of zinc acts as an astringent, and as a tonic and antispasmodic. Its chief use is that of a topical astringent; as a lotion to a variety of skin diseases, as a collyrium in ophthalmia, as an injection in gonorrhœa and leucorrhœa, &c. It is rarely used internally, its actions and uses being similar to those of the sulphate.

**Zinci Sulphas** ($ZnSO_4 7H_2O$)—Sulphate of Zinc—White Vitriol.

PREPARATION.—*Take of granulated zinc,* 16 *ounces; sulphuric acid,* 12 *fluid ounces; distilled water,* 4 *pints; solution of chlorine, a sufficiency; carbonate of zinc,* ½ *ounce, or a sufficiency. Pour the sulphuric acid previously mixed with the water on the zinc contained in a porcelain basin, and, when effervescence has nearly ceased, aid the action by a gentle heat. Filter the fluid into a gallon bottle, and add gradually with constant agitation the solution of chlorine until the fluid acquires a permanent odour of chlorine. Add now with continued agitation the carbonate of zinc until a brown precipitate appears; let it settle, filter the solution, evaporate till a pellicle forms on the surface, and set aside to crystallize. Dry the crystals by exposure to the air on filtering paper placed on porous tiles. More crystals may be obtained by again evaporating the mother liquor.*

*Characters.*—In colourless, transparent prismatic crystals, with a strong metallic styptic taste. Its solution in water gives white precipitates with chloride of barium, and sulphide of ammonium.

*Dose.*—As a tonic and astringent, one to five or ten grains, gradually increased, in pill or solution; as an emetic, ten to thirty grains; as a solution or injection, one to thirty grains to an ounce of fluid.

*Therapeutics.*—Sulphate of zinc in over-doses acts as a purely irritant poison, causing violent vomiting with severe abdominal pain, followed by extreme prostration, with or without convulsions. Treatment, encourage vomiting by the administration of warm water. Antidotes, albumen, infusions containing tannin, and treat the symptoms as they arise. Medicinally, it acts as a nervine tonic, astringent, and anti-spasmodic; as a safe, prompt, and energetic stimulating emetic; and externally, as a topical astringent. It was employed in epilepsy, chorea, hysteria, spermatorrhœa, nervous exhaustion from excesses, spasmodic asthma, angina pectoris, chronic diarrhœa, dysentery, and in other chronic passive discharges, &c. As an emetic, it causes but little subsequent depression, and is useful in narcotic poisoning, &c.; as an injection, it is used in gonorrhœa, leucorrhœa, &c. As an astringent lotion, it is applied to certain varieties of ulcers and chronic skin diseases; as a collyrium, in ophthalmia; as a caustic, it is used in the anhydrous state of dried sulphate of zinc, and is applied to broken diseased surfaces, as it does not operate as such where the epithelium is entire.

## **Zinci Valerianas** ($Zn(C_5H_9O_2)_2$)—Valerianate of Zinc.

PREPARATION.—*Take of sulphate of zinc,* 5¾ *ounces; valerianate of soda,* 5 *ounces; distilled water, a sufficiency. Dissolve the sulphate of zinc and the valerianate of soda, each in two pints of the water; raise both solutions to near the boiling point; mix them, cool, and skim off the crystals which are produced. Evaporate the mother-liquor at a heat not exceeding* 200°, *till it is reduced to four ounces; cool again, remove the crystals which have formed, and add them to those which have been already obtained. Drain the crystals on a paper filter, and wash them with a small quantity of cold distilled water, till the washings give but a very feeble precipitate with chloride of barium. Let them now be again drained, and dried on filtering paper at ordinary temperatures.*

*Characters.*—In brilliant-white pearly, tabular, crystals, with a feeble odour of valerianic acid, and a metallic taste; scarcely soluble in cold water or in ether; soluble in hot water and alcohol. Heated to redness in an open crucible, it leaves a residue which, when dissolved in diluted sulphuric acid, yields, with ammonia, a precipitate which entirely dissolves in excess of the reagent, and the resulting solution gives a white precipitate with sulphide of ammonium.

*Dose.*—Half-a-grain to two or three grains, in pill.

*Therapeutics.*—Valerianate of zinc acts as a nervine tonic and anti-spasmodic; it is employed in those cases in which the other preparations of zinc are used; but it is believed by some to be especially useful in cases complicated with hysteria, and has been highly recommended in the neuralgia of that class. As, however, there is good reason to consider valerianic acid inert, it is difficult to conceive wherein the valerianate should be superior to the other salts of zinc as a nervitonic.

**CADMIUM** ($Cd=112$) is a somewhat rare metal, and is contained in certain of the zinc ores, from which it may be easily separated, in consequence of its being more volatile than zinc. It is a lustrous metal, resembling tin in most of its properties. *Iodide of Cadmium* (*Cadmii Iodidum*, $CdI_2$), as well as its ointment, has already been noticed under Iodine, since it agrees more in its actions with iodine than with cadmium. *Sulphate of Cadmium* (*Cadmii Sulphas*, $CdSO_4 4H_2O$) may be prepared by dissolving cadmium in equal parts of nitric acid and water, by the aid of heat, precipitating the carbonate of cadmium by carbonate of soda, washing this carefully, and dissolving it in diluted sulphuric acid, and finally evaporating and crystallizing. It forms transparent, colourless, prismatic crystals, which effloresce in the air, and are very soluble in water. Sulphate of cadmium has been proposed as a substitute for sulphate of zinc, which it closely resembles in its properties, but is more powerful. In over-doses it is a powerful irritant poison. It is used externally as a lotion, collyrium, or injection, in chronic inflammatory affections of the eye and ear, &c.

**STANNUM** ($Sn=118$)—Tin—is chiefly obtained from the native peroxide, which is widely distributed. Tin is a silvery-white or yellowish-white metal, of a hardness between gold and lead, malleable, but imperfectly ductile. Grain tin, procured from stream tin, is the purest form of the metal, and from this is prepared, by fusing it, and pouring it into water, the granulated tin which is placed in the Appendix of the Pharmacopœia. *Pulvis Stanni—Limatura Stanni—Powdered Tin, or Tin Filings*—has been used as a vermifuge, its action as such depending probably upon the mechanical irritation of its particles; but it has been suggested that it might arise from the evolution of hydrogen during the solution of the metal in the gastric fluid. *Dose*, twenty to sixty grains, or more, mixed with treacle, several times repeated, preceded and followed by a laxative. *Stanni Chloridum—Chloride of Tin or Butter of Tin* ($SnCl_2$)—has been employed as a tonic and antispasmodic in epilepsy, chorea, &c., and externally as a lotion in certain chronic cutaneous diseases, &c. *Dose*, a tenth of a grain to half-a-grain. In large doses it acts as an irritant poison, producing violent convulsions. Solution of chloride of tin is used as a test.

**BISMUTHUM** ($Bi=210$)—Bismuth—in the native state is widely distributed, and is readily extracted from its ores by fusion. It is a reddish-white, tasteless, inodorous metal. It may be obtained in beautiful masses of iridescent cubical crystals. Commercial bismuth may contain several metallic impurities, such as arsenic, iron, copper, &c.

The Pharmacopœia gives the following formula for obtaining pure bismuth :—

**Bismuthum Purificatum**—Purified Bismuth.

PREPARATION.—*Take of bismuth,* 10 *ounces; nitrate of potash, in powder,* 2 *ounces. Put the bismuth and one ounce of the nitrate of potash into a crucible, and heat them to a temperature at which both the metal and the salt are fused. Continue the heat, constantly stirring the contents of the crucible, for fifteen minutes, or until the salt has solidified into a slag over the metal. Then remove the salt, add the remainder of the nitrate of potash to the bismuth in the crucible, and repeat the process as before. Finally, pour the bismuth while fused into a suitable mould, and allow it to cool.*

The impurities form a slag with the nitre, and are thus separated.

*Characters.*—A crystalline metal of a greyish-white colour, with a distinct roseate tinge. Specific gravity, 9·83.

**Bismuthi Subnitras** ($BiNO_4H_2O$)—Subnitrate of Bismuth —Bismuthum Album—White Bismuth.

PREPARATION.—*Take of purified bismuth, in small pieces,* 2 *ounces; nitric acid,* 4 *fluid ounces; distilled water, a sufficiency. Mix the nitric acid with three ounces of distilled water, and add the bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any insoluble matter that may be present. Evap[illegible]te the solution until it is reduced to two fluid ounces, and pour it into half-a-gallon of distille[illegible]ter. When the precipitate which forms has subsided, decant the sup[illegible]atant liquid, add half-a-gallon of distilled water to the precipitate, stir them well together, and after two hours decant off the liquid, collect and drain the precipitate in a calico filter, press it with the hands, and dry it at a temperature not exceeding* 150°.

*Characters.*—A heavy white powder in minute crystalline scales, blackened by sulphuretted hydrogen, insoluble in water, but soluble *cipitate with chloride of barium. Dissolve the citric acid in eight nces of distilled water, and, having applied the heat of a water-bath, ld the oxide of iron, previously well drained, and stir them together ntil the whole or nearly the whole of the oxide has dissolved. Let the olution cool; then add five and a-half fluid ounces of solution of ammonia. Filter through flannel; evaporate to the consistency of syrup, and dry it in thin layers, on flat porcelain or glass plates, at a temperature not exceeding* 100°. *Remove the dry salt in flakes, and keep it in a stoppered bottle.*

*Characters.*—In thin transparent scales of a deep red colour, slightly sweetish and astringent in taste; it feebly reddens litmus paper, is soluble in water, but almost insoluble in rectified spirit. Heated with solution of potash, it evolves ammonia and deposits peroxide of iron. The alkaline solution from which the iron has separated does not, when slightly supersaturated with acetic acid, give any crystalline deposit.

*Dose.*—Three to eight grains, in solution.

*Therapeutics.*—Citrate of iron and ammonia acts as a mild non-astringent chalybeate, given to delicate females and children.

**Vinum Ferri Citratis**—Wine of the Citrate of Iron.

PREPARATION.—*Take of citrate of iron and ammonia,* 160 *grains; orange wine,* 1 *pint; dissolve, and let the solution remain for three days in a closed vessel, shaking it occasionally; afterwards filter.*

*Therapeutics.*—An excellent chalybeate, much less likely to decompose than the Vinum Ferri.

*Dose.*—One to four fluid drachms.

FERRI ET QUINIÆ CITRAS—Citrate of Iron and Quinia—Citric Acid combined with Peroxide of Iron, Protoxide of Iron, and Quinia.

PREPARATION.—*Take of solution of persulphate of iron,* 4½ *fluid ounces; sulphate of quinia,* 1 *ounce; diluted sulphuric acid,* 12 *fluid drachms; citric acid,* 3 *ounces; solution of ammonia, distilled water, of each, a sufficiency. Mix eight fluid ounces of the solution of ammonia with two pints of distilled water, and to this add the solution of persulphate of iron, previously diluted with two pints of distilled water, stirring them constantly and briskly. Let the mixture stand for two hours, stirring it occasionally. Then put it on a calico filter, an when the liquid has drained away, wash the precipitate with distille water until that which passes through the filter ceases to give a precipita* *with chloride of barium. Mix the sulphate of quinia with eight ounces of distilled water, add the diluted sulphuric acid, and when the salt is dissolved, precipitate the quinia with a slight excess of solution of ammonia. Collect the precipitate on a filter, and wash it with a pint and a-half of distilled water. Dissolve the citric acid in five ounces of distilled water, and having applied the heat of a water-bath, add the oxide of iron, previously well drained; stir them together, and when the oxide has dissolved, add the precipitated quinia, continuing the agitation until this also has dissolved. Let the solution cool, then add, in small quantities at a time, twelve fluid drachms of solution of ammonia, diluted with two fluid ounces of distilled water, stirring the solution briskly, and allowing the quinia, which separates with each addition of ammonia, to dissolve before the next addition is made. Filter the solution evaporated to the consistence of a thin syrup, then dry it in thin layers on flat porcelain or glass plates, at a temperature of* 100°. *Remove the dry salt in flakes, and keep it in a stoppered bottle.*

*Characters.*—Thin scales of a greenish golden-yellow colour, somewhat deliquescent, and entirely soluble in cold water. The solution is very slightly acid, and is precipitated reddish-brown by solution of soda, white by solution of ammonia, blue by the yellow and red prussiates of potash, white and greyish-black by tannic acid.

*Dose.*—Three to eight or ten grains. The citrate of iron and quinia acts, in the double capacity of its united constituents, as a non-astringent chalybeate and tonic. It is not, however, a very satisfactory preparation, as it does not always contain its proper proportion of quinine.

### **Tinctura Ferri Acetatis**—Tincture of the Acetate of Iron.

PREPARATION.—*Take of solution of persulphate of iron,* 2½ *fluid ounces; acetate of potash,* 2 *ounces; rectified spirit, a sufficiency. Dissolve the acetate of potash in ten fluid ounces, and add the persulphate of iron to eight fluid ounces of the spirit, then mix the two solutions in a two-pint bottle and shake them well together, repeating the agitation several times during an hour. Put the tincture, with the precipitated salt contained in it, upon a filter, and when the liquid has ceased to run through, put as much rectified spirit upon the filter as will make the filtered product measure one pint.*

*Therapeutics.*—A ferruginous tonic and chalybeate. It is introduced from the Dublin Pharmacopœia. It is questionable whether its special merits are such as entitle it to a place in the Pharmacopœia, which is already so rich in chalybeate preparations.

*Dose.*—Five to thirty minims.

*constantly stirring the mixture as it is formed. Collect the precipitate on a calico filter, and wash it with distilled water until the washings pass tasteless. Remove now as much of the adhering water as can be separated from the precipitate by slight pressure with the hands, and finally dry the product at a temperature not exceeding* 150°.

*Characters.*—A white powder blackened by sulphuretted hydrogen; insoluble in water, but soluble with effervescence in nitric acid. When added to sulphuric acid, coloured with sulphate of indigo, the colour of the latter is not discharged. If to nitric acid, mixed with half its volume of distilled water, as much carbonate of bismuth be added as the acid will dissolve, one volume of this solution poured into twenty volumes of water will yield a white precipitate. The nitric acid solution gives no precipitate with diluted sulphuric acid, or with solution of nitrate of silver.

*Dose.*—Five to twenty grains.

*Therapeutics.*—The carbonate agrees in action with the subnitrate; but from its greater solubility in the gastric juice, it is found to agree when the subnitrate occasions a sensation of weight, and even prickling, in the stomach. For this reason, and also because it is slightly antacid, it is often to be preferred in cases in which the tongue is red and pointed, or when digestion is painful, and accompanied by belching of acid matters, smelling of sulphuretted hydrogen.

## **Bismuthi Oxidum**—Oxide of Bismuth ($Bi_2O_3$).

PREPARATION.—*Take of subnitrate of bismuth,* 1 *pound; solution of soda,* 4 *pints. Mix and boil for five minutes; then having allowed the mixture to cool and the oxide to subside, decant the supernatant liquid, wash the precipitate thoroughly with distilled water, and finally dry the oxide by the heat of a water bath.*

*Characters.*—A dull lemon-yellow powder. Heated to incipient redness it is not diminished in weight. It is insoluble in water, but soluble in nitric acid mixed with half its volume of water, and if it be thus dissolved to saturation, the solution mixed with ten or twenty times its volume of water yields a white precipitate. The nitric acid solution gives no precipitate with dilute sulphuric acid, nor with solution of nitrate of silver dropped into it. Solution of chloride of ammonium added to the nitric acid solution gives a white precipitate, and if this be treated with excess of solution of ammonia, then filtered, and the clear filtrate neutralised with hydrochloric acid, it will not become turbid.

*Dose.*—Five to fifteen grains; used in the same way and for the same purposes as the subnitrate. It is a definite compound, usually free from impurities, and may therefore be safely prescribed.

**Liquor Bismuthi et Ammoniæ Citratis**—Solution of Citrate of Bismuth and Ammonia—Liquor Bismuthi.

PREPARATION.—*Take of purified bismuth*, 430 *grains; nitric acid*, 2 *fluid ounces; citric acid*, 2 *ounces; solution of ammonia and distilled water, of each a sufficiency. Mix the nitric acid with an ounce of distilled water, and add the bismuth in successive portions. When effervescence has ceased, apply for ten minutes a heat approaching that of ebullition, and decant the solution from any insoluble matter that may be present. Evaporate the solution until it is reduced to two fluid ounces. Then add the citric acid previously dissolved in four ounces of distilled water, and afterwards the solution of ammonia in small quantities at a time, until the precipitate formed is redissolved, and the solution is neutral or slightly alkaline to test-paper. Dilute with distilled water to the volume of one pint.*

*Characters.*—A colourless solution, with a saline and slightly metallic taste. Specific gravity, 1·122. Neutral or slightly alkaline to test-paper; mixes with water without change; heated with solution of potash it evolves ammonia, and yields a white precipitate. Hydrochloric acid added to it gives a white precipitate, which is soluble in excess of the reagent. Three fluid drachms of the solution, mixed with an ounce of distilled water, and treated with sulphuretted hydrogen in excess, yields a black precipitate, which, collected, washed, and dried, weighs 9·92 grains. One fluid drachm contains three grains of oxide of bismuth.

*Therapeutics.*—This solution contains citrate of bismuth, dissolved in citrate and nitrate of ammonia, and was introduced into the B. P. as the representative of Schacht's Liquor Bismuth. The process in the Pharmacopœia seems, however, essentially defective, as there is no means of getting rid of the nitric acid. Prepared according to this process, there is found, on testing, a considerable quantity of nitric acid, whereas Schacht's preparation gives indication of only a trace. Schacht's solution is formed by first dissolving bismuth in nitric acid, then throwing down the teroxide of bismuth with ammonia; filtering, washing the filter to get rid of the nitric acid, and afterwards dissolving it in boiling citrate of ammonia. It was represented to be a convenient form for giving bismuth in solution, being soluble in water; but it has the great disadvantage of being irritant in large doses. Besides it is doubtful if it is so beneficial to give bismuth in a soluble form, because much of the peculiar value of the ordinary forms of bismuth depends upon their insolubility, enabling them to act slowly and persistently.

*Dose.*—One-half to one fluid drachm.

**PLUMBUM** (Pb=207)—Lead—The Saturn of alchemists—occurs in a variety of native compounds, but its chief source for commercial purposes, is the sulphide commonly called *galena*. Pure lead is a bluish-white, brilliant, soft and flexible metal; it soon tarnishes when exposed to the air, emits a peculiar odour when handled, leaves a dark streak upon paper, and has a specific gravity of 11·4.

In the metallic form lead is inert in the system, but its soluble salts are astringent and sedative, and have, moreover, an action peculiarly their own. The vapour of lead inhaled produces the same effects as the soluble salts when taken by the stomach; but in all cases the metal must assume a soluble condition either before its administration, or in the gastric fluid, before it can influence the system through the circulation. In large doses the soluble salts of lead act as irritants, and produce the ordinary symptoms, but acute lead poisoning is comparatively rare; in such cases the vomiting is not generally very violent, but the colicky pains are very severe, and there is obstinate constipation. On the other hand, chronic poisoning by lead is a common occurrence. It arises from the gradual accumulation of the poison in the system, either by drinking water in which it is dissolved; or by its absorption through the skin, though this can be but to a limited extent; or by its entrance through wounds and abrasions; or in consequence of the dirty habits of those who work amongst it, whereby it is conveyed by the unwashed hands to the food, and therewith transmitted to the stomach; or lastly, by the prolonged medicinal use of one of its salts. *Lead* or *saturnine colic*, or *colica pictonum*, or *painter's colic*, as it is variously called, is the most common manifestation of lead poisoning. In these cases there is an uneasiness, a sense of sinking, and a twisting pain in the neighbourhood of the umbilicus: the abdominal parietes are retracted, rigid, and knotty, and relief is obtained by pressing the abdomen; there is obstinate constipation, loss of appetite, increasing thirst, dryness of the mouth and throat, a sweetish astringent taste, the patient stating that the bitterest substances taste sweet to him, fetid breath, dry and yellowish or dusky skin and conjunctiva, sallow and shrunken countenance, general emaciation, great depression of spirits, and a characteristic blue line along the margins of the gums, which is interrupted wherever a tooth is lost. This blue line is supposed to be due to the formation of sulphide of lead, produced in that situation by the decomposition of particles of food collected between the teeth. It was first observed by Dr. Burton. If the poisoning be continued, paralysis usually follows, though in rare instances it precedes, the colicky symptoms. There may be loss of sensation as well as of voluntary motion, and either or both may be accompanied by flitting neuralgic pains in different parts of the body, which is usually attributed by the patient to rheumatism. These, like the abdominal pains, are usually relieved by pressure, but are aggravated by motion. The most common form of lead palsy is the *dropped-hand* or *wrist-drop*, due to the implication of the extensor muscles of the fore-arm, which, together with the muscles constituting the ball of the thumb, gradually waste away. If the cause be not removed after these symptoms have spread themselves more or less over the trunk and extremities, the brain becomes implicated, being at first sluggish and dull to external impressions, but ultimately taking an abnormal action in the form of delirium, convulsions, or coma, followed by death, or amaurosis, neuralgic pains, general convulsions, and chronic nephritis. There are several names applied to the symptoms of lead poisoning. Thus, in addition to those already mentioned, the term *lead arthralgy* or *metallic rheumatism* is applied to the flitting pains; when there is loss of sensation, it is called *lead* or *saturnine anæsthesia;* and lastly, the affections of the brain are classed under the form *lead* or *saturnine encephalopathy.*

*Antidotes.*—When the poisoning results from a single over-dose, the indications are to evacuate the stomach by means of an emetic, or by the stomach pump, and this may be preceded by, and certainly should immediately be followed by, a solution of some harmless sulphate, as of magnesia or of soda, with the view of forming the almost inert sulphate of lead; and if in excess, these sulphates, by producing purgation, eliminate the lead compounds from the intestinal canal; to allay irritation, give opiates and demulcents. Lead colic is usually relieved by a dose of castor oil and a few drops of laudanum; if this fails, croton oil may be given, or alum, in drachm doses. Chronic poisoning is to be combated first by attending to the immediate wants of the patient, and secondly, by eliminating the poison, which can only be effected slowly. Dilute sulphuric acid or sulphate of magnesia may be given to check the action of any of the poison which may still linger in the alimentary canal, whilst factitious sulphur baths may be used to convert that which is near the surface of the body into inert sulphide of lead, whereby the skin is temporarily blackened: in the intervals of the baths the skin should be well rubbed.

Iodide of potassium may be given with the view of promoting the discharge of the poison by rendering it more soluble. To prevent lead poisoning, it is necessary to observe cleanliness in the use of leaden or pewter vessels in which food is kept, to avoid the use of water containing the poison, to wash carefully before meals when employed amongst substances containing lead, and also in such cases to take occasional doses of dilute sulphuric acid, or of Epsom salts, if necessary, &c.

**Plumbi Oxidum** (Pbo)—Lythargyrum—Litharge—Oxide of Lead.

Protoxide of lead is formed when the temperature of melted lead is raised to a white heat; it then burns with a brilliant flame, and produces fumes of protoxide, which on cooling constitute *Flowers of lead.* When the grey powder formed on the surface of melted lead is exposed to the continued action of heat and air, the *massicot* of commerce is produced, and this, when fused and again solidified by cooling, forms the crystalline mass called litharge.

*Characters.*—In heavy scales of a pale brick-red colour, completely soluble without effervescence in diluted nitric and acetic acids, either solution, when neutral, giving a copious yellow precipitate with iodide of potassium.

EMPLASTRUM PLUMBI—LEAD PLASTER—Emplastrum Lithargyri—Diachylon Plaster.—*Take of oxide of lead, in fine powder, 4 pounds; olive oil, 1 gallon; water, 3½ pints. Boil all the ingredients together gently by the heat of a steam-bath, and keep them simmering for four or five hours, stirring constantly until the product acquires a proper consistence for a plaster, and adding more water during the process if necessary.*

*Therapeutics.*—Oxide of lead is rarely employed except in the preparation of the plaster; it has been used as a desiccant and astringent, dusted over abrasions, ulcers, burns, &c., but it is a somewhat dangerous application. It is never used internally. Lead plaster is employed as the basis of all true plasters. In its preparation the oleic and margaric acids of the oil combine with the oxide of lead to form oleate and margarate of lead, glycerine, which is at the same time set free, being dissolved out by the water. Lead plaster is used as a support to weak parts and as a common strapping.

**Plumbi Carbonas** 2($PbCO_3$, $PbO,H_2O$)—Carbonate of Lead—White Lead.

Carbonate of lead is prepared in a variety of ways; chiefly by exposing sheet lead, or bars of lead, to the fumes of acetic or pyroligneous acid, whereby an acetate of lead is formed, which is immediately decomposed by carbonic acid, derived from a mixture of dung and tan in which the vessels containing the acid are placed, and is thus converted into carbonate.

*Characters.*—A soft heavy white powder, blackened by sulphuretted hydrogen, insoluble in water, soluble with effervescence in diluted acetic acid without leaving any residue, and forming a solution which is precipitated white by sulphuric acid, and yellow by iodine of potassium.

UNGUENTUM PLUMBI CARBONATIS—OINTMENT OF CARBONATE OF LEAD.—*Take of carbonate of lead, in fine powder,* 62 *grains; simple ointment,* 1 *ounce. Mix thoroughly.*

*Therapeutics.*—Carbonate of lead is never used internally; but it is sometimes employed as a desiccant and astringent, and, combined with starch, may be dusted over sores, ulcers, chronic eczema, &c.; but it is apt to be absorbed and produce dangerous results. The ointment is used as a sedative and astringent application to ulcerations, acute skin diseases, excoriations, &c.

**Plumbi Acetas** (Pb $(C_2H_3O_2)_2 3H_2O$)—Acetate of Lead—Sugar of Lead.

PREPARATION.—*Take of oxide of lead, in fine powder,* 24 *ounces; acetic acid,* 2 *pints, or a sufficiency; distilled water,* 1 *pint. Mix the acetic acid and the water, add the oxide of lead, and dissolve with the aid of a gentle heat. Filter, evaporate till a pellicle forms, and set aside to crystallize, first adding a little acetic acid should the fluid not have a distinctly acid reaction. Drain, and dry the crystals on filtering paper, without heat.*

*Characters.*—In white crystalline masses, slightly efflorescent, having an acetous odour, and a sweet astringent taste. Its solution in water slightly reddens litmus, gives a yellow precipitate with iodide of potassium, and is precipitated white by sulphuric acid, acetic acid being set free.

PILULA PLUMBI CUM OPIO—PILL OF LEAD AND OPIUM.—*Take of acetate of lead, in fine powder,* 36 *grains; opium, in fine powder,* 6 *grains; confection of roses,* 6 *grains. Beat them into a uniform mass.*

*Dose.*—Of the acetate, two to three grains, repeated every two or three hours; or in larger doses, up to eight or ten grains, thrice a-day; it may be given in pill with confection of roses; if given in mixture, a little acetic acid must be added to keep it in solution, otherwise the carbonic acid present in water would precipitate it. As a lotion or collyrium, from two to ten or twenty or more grains, dissolved in an ounce of water with a little acetic acid to facilitate the solution. It should not be used as a collyrium when there is ulceration of the cornea, as it is apt to cause a permanent opacity. Of the *Pilula Plumbi cum Opio*, one four-grain pill (containing three grains of the acetate, half-a-grain of opium, and half-a-grain of confection of roses) may be repeated every two or three hours.

SUPPOSITORIA PLUMBI COMPOSITA—COMPOUND SUPPOSITORIES OF LEAD.

PREPARATION.—*Take of acetate of lead*, 36 *grains; opium, in powder*, 12 *grains; benzoated lard*, 42 *grains; white wax*, 10 *grains; oil of theobroma*, 80 *grains. Melt the wax and oil of theobroma with a gentle heat, then add the other ingredients previously rubbed together in a mortar, and having mixed them thoroughly, pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.*

*Therapeutics.*—An astringent, antispasmodic, sedative anodyne, and narcotic application, useful in piles, in inflamed and irritable states of the rectum generally. One to be used at intervals, depending on the effects required to be produced. Each suppository contains one grain of opium and three grains of the acetate of lead.

UNGUENTUM PLUMBI ACETATIS—OINTMENT OF ACETATE OF LEAD.—*Take of acetate of lead, in fine powder*, 12 *grains; benzoated lard*, 1 *ounce; mix thoroughly.*

*Therapeutics.*—Acetate of lead in over-doses may act as an irritant poison, the treatment for which has already been mentioned in the previous general remarks upon the soluble salts of lead. Medicinally, it acts as an astringent and sedative; it is useful in choleraic diarrhœa, and in chronic diarrhœa and dysentery; in both active and passive hæmorrhages from the lungs, stomach, bowels, urinary organs, and uterus; in menorrhagia; in chronic bronchitis with profuse secretion of mucus; in excessive salivation produced by mercury; in ulceration of the stomach, &c. Externally, as a lotion or ointment in a variety of inflammatory skin diseases, superficial inflammations, erysipelas, sprains, abrasions, &c.; as a collyrium, in ophthalmia, and in the state of impalpable powder it is applied to granular ophthalmia; as an injection, in gonorrhœa, gleet, leucorrhœa, &c.

**Liquor Plumbi Subacetatis**—Solution of Subacetate of Lead—Liquor Plumbi Diacetatis—Goulard's Extract—Subacetate of Lead ($Pb_2C_4H_6O_4$) dissolved in water.

PREPARATION.—*Take of acetate of lead,* 5 *ounces; oxide of lead, in powder,* 3½ *ounces; distilled water,* 1 *pint, or a sufficiency. Boil the acetate of lead and the oxide of lead in the water for half-an-hour, constantly stirring; then filter, and when the liquid is cold, add to it more distilled water, until the product measures* 20 *fluid ounces. Keep the clear solution in stoppered bottles.*

*Characters.*—A dense, clear, colourless liquid, with alkaline reaction and sweet astringent taste, becoming turbid by exposure to the air; and forming with mucilage of gum arabic an opaque white jelly. Sulphuric acid in excess gives a white precipitate, acetic acid being set free.

LIQUOR PLUMBI SUBACETATIS DILUTUS—DILUTE SOLUTION OF SUBACETATE OF LEAD—GOULARD WATER.—*Take of solution of subacetate of lead, rectified spirit, of each* 2 *fluid drachms; distilled water,* 19½ *fluid ounces. Mix, and filter through paper. Keep the clear solution in a stoppered bottle.*

UNGUENTUM PLUMBI SUBACETATIS COMPOSITUM—COMPOUND OINTMENT OF SUBACETATE OF LEAD—GOULARD'S CERATE. —*Take of solution of subacetate of lead,* 6 *fluid ounces; camphor,* 60 *grains; white wax,* 8 *ounces; oil of almonds,* 1 *pint. Melt the wax with sixteen ounces of the oil by the heat of a water-bath, remove the vessel, and, as soon as the mixture begins to thicken, gradually add the solution of subacetate of lead, and stir the mixture constantly while it cools; then add the camphor dissolved in the rest of the oil, and mix thoroughly.*

*Therapeutics.*—Solution of subacetate of lead is not used internally; in large doses it is poisonous. Externally, the dilute solution and ointment are useful as a mild astringent and sedative application to many irritable and itching skin diseases, superficial inflammations, erysipelas, bruises, sprains, abrasions, burns, chilblains, &c.; as a collyrium, except when there is ulceration of the cornea; as an injection in leucorrhœa, &c.; as a wash and gargle in mercurial salivation and syphilitic sore throat, &c.

PLUMBI NITRAS—NITRATE OF LEAD—($Pb(NO_3)_2$).—May be prepared by saturating dilute nitric acid with litharge with the aid of a gentle heat, filtering and crystallizing.

*Characters.*—In colourless, octahedral crystals, which are nearly opaque, permanent in the air, of a sweetish astringent taste, soluble in water and in alcohol.

*Therapeutics.*—The nitrate is rarely used internally, and acts like the acetate, but is more irritant, in doses of half-a-grain to a grain. In solution, it has been used as an application to chapped nipples, &c. As a deodoriser and so-called disinfectant, it is used because it decomposes sulphuretted hydrogen. *Ledoyen's Disinfecting Fluid* is a solution of this salt, in the proportion of a drachm to an ounce. *Fused Nitrate of Lead* may be used as a caustic. It is used in the preparation of iodide of lead.

PLUMBI IODIDUM—And its plaster and ointment, which are now officinal, are given under Iodine, at pages 25, 26.

**STIBIUM** (Sb = 122)—Antimonium—Antimony is chiefly obtained from the native sulphide, the Stibium of the ancients. It is a brilliant, bluish-white, crystalline, brittle metal, having a specific gravity of 6·7. The metal itself is not used medicinally, the officinal preparations being obtained from the sulphuret.

**Antimonium Nigrum**—BLACK ANTIMONY—Antimonii Sulphuretum Præparatum—Prepared Sulphuret of Antimony—Antimonii Tersulphuretum—Crude Antimony—Native sulphide of antimony ($Sb_2S_3$) purified from siliceous matter by fusion, and afterwards reduced to fine powder. It is placed in the Pharmacopœia as the source of antimonial preparations. It may contain other sulphides, as of arsenic, lead, copper, or iron.

*Characters and Tests.*—A greyish-black crystalline powder. It dissolves almost entirely in boiling hydrochloric acid, evolving sulphuretted hydrogen.

**Antimonium Sulphuratum**—Sulphurated Antimony—Antimonii Oxysulphuretum—Antimonii Sulphuretum Aureum—Golden Sulphuret of Antimony—Antimonii Sulphuretum Præcipitatum, $Sb_2S_3$, with a small and variable amount of oxide of antimony, or $Sb_2O_3$.

PREPARATION.—*Take of black antimony,* 10 *ounces; solution of soda,* 4½ *pints; diluted sulphuric acid, a sufficiency; distilled water, a sufficiency. Mix the sulphuret of antimony with the solution of soda, and boil for two hours with frequent stirring, adding distilled water occasionally to maintain the same volume. Strain the liquor through calico, and, before it cools, add to it by degrees the diluted sulphuric* *acid till the latter is in slight excess. Collect the precipitate on a calico filter, wash with distilled water till the washings no longer precipitate with chloride of barium, and dry at a temperature not exceeding* 212°.

*Characters.*—An orange-red powder, readily dissolved by caustic soda, also by hydrochloric acid with the evolution of sulphuretted hydrogen and the separation of a little sulphur. Boiled in water with acid tartrate of potash, the resulting solution is precipitated orange-red with sulphuretted hydrogen.

*Dose.*—One to four or five grains, but it is seldom prescribed otherwise than in the compound calomel or Plummer's pill. In larger doses, up to ten or twenty grains, it is emetic.

*Therapeutics.*—Sulphurated antimony is said to act as an alterative, diaphoretic, and emetic, but it is so uncertain in its operation on account of its insolubility, that it is rarely employed alone. In the form of Plummer's pill it is used with advantage as an alterative in cutaneous diseases, especially those of syphilitic origin, in chronic rheumatism, &c.

**Antimonii Chloridi Liquor**—Solution of Chloride of Antimony—Chloride of Antimony, $SbCl_3$, dissolved in hydrochloric acid.

PREPARATION.—*Take of black antimony,* 1 *pound; hydrochloric acid,* 4 *pints. Place the black antimony in a porcelain vessel; pour upon it the hydrochloric acid, and, constantly stirring, apply to the mixture, beneath a flue with a good draught, a gentle heat, which must be gradually augmented as the evolution of gas begins to slacken, until the liquid boils. Maintain it at this temperature for fifteen minutes; then remove the vessel from the fire, and filter the liquid through calico into another vessel, returning what passes through first, that a perfectly clear solution may be obtained. Boil this down to the bulk of two pints, and preserve it in a stoppered bottle.*

*Characters.*—A heavy liquid, usually of a yellowish-red colour. A little of it dropped into water gives a white precipitate, and the filtered solution lets fall a copious deposit on the addition of nitrate of silver. If the white precipitate formed by water be treated with sulphuretted hydrogen, it becomes orange-coloured.

*Therapeutics.*—Terchloride of antimony was formerly employed in the solid form of *butter of antimony,* but now it is rarely used otherwise than in solution. It acts as a powerful caustic, and as such is applied to the bites of rabid animals, poisoned wounds, cancerous, phagedenic, and sloughing ulcerations, &c. It is also found useful in cases of persistent acne of the face, frequently associated with uterine derangement. Its action in this case is easily limited by brushing the part with carbonate of soda immediately after the application of the chloride. It is sometimes employed with advantage in hypertrophied conditions of the skin, acting as a discutient upon cutaneous tubercles. When swallowed, it acts as a powerful corrosive poison, the symptoms and treatment being similar to those of poisoning by hydrochloric acid.

**Antimonii Oxidum** ($Sb_2O_3$)—Oxide of Antimony—Flowers of Antimony.

PREPARATION.—*Take solution of chloride of antimony,* 16 *fluid ounces; carbonate of soda,* 6 *ounces; water,* 2 *gallons; distilled water, a sufficiency. Pour the antimonial solution into the water, mix thoroughly, let the precipitate settle, and remove the supernatant liquid by a siphon; add one gallon of distilled water, agitate well, let the precipitate subside; again withdraw the fluid, and repeat the processes of affusion of distilled water, agitation, and subsidence. Add now the carbonate of soda, previously dissolved in two pints of distilled water, leave them in contact for half-an-hour, stirring frequently, collect the deposit on a calico filter, and wash with boiling distilled water until the washings cease to give a precipitate with a solution of nitrate of silver acidulated by nitric acid. Lastly, dry the product at a heat not exceeding* 212°.

*Characters.*—A greyish-white powder, fusible at a low red heat, insoluble in water, but readily dissolved by hydrochloric acid. The solution, dropped into distilled water, gives a white deposit, at once changed to orange by sulphuretted hydrogen.

PULVIS ANTIMONIALIS—ANTIMONIAL POWDER.—*Take of oxide of antimony,* 1 *ounce; phosphate of lime,* 2 *ounces. Mix them thoroughly.*

This is a white, tasteless, inodorous powder, and is the officinal representative of the empirical and patented *James's fever powder,* which has for so many years been held in high estimation. Opinions differ as to the constitution of James's powder, but most of the samples analysed appeared to consist of a small quantity of oxide of antimony, with a trace of antimonite of lime, the bulk of the powder being made up of inert antimonious acid and phosphate of lime. The officinal powder consists of one portion of oxide of antimony to two of the precipitated phosphate of lime, and has not, in consequence of the phosphate being prepared by precipitation, the gritty taste of the old antimonial powder.

*Dose.*—Of the oxide, three to ten grains, in powder or pill; of antimonial powder, two to five or ten or more grains; but the larger doses, unless approached by degrees, may cause vomiting; it may be given in powder or pills. The previous antimonial powders, from the method of their preparation, were of very uncertain strength, and were given in doses which it would be dangerous to adopt with the present uniform powder.

*Therapeutics.*—Oxide of antimony and antimonial powder in small doses of two or three grains act as alteratives; in somewhat larger doses, as diaphoretics; and in still larger doses, as emetics and irritants. Their action and uses resemble those of tartaric emetic, but, being less soluble, they are also less energetic. As alteratives they are useful in the treatment of chronic skin diseases; and as diaphoretics they are employed in such febrile and inflammatory cases as are relieved by sweating.

**Antimonium Tartaratum** (or $KSbC_4H_4O_7H_2O$)—Tartarated Antimony—Antimonii Potassio-Tartras—Antimonii et Potassæ Tartras—Tartrate of Antimony and Potash—Tartar Emetic.

PREPARATION.—*Take of oxide of antimony,* 5 *ounces; acid tartrate of potash, in fine powder,* 6 *ounces; distilled water,* 2 *pints. Mix the oxide of antimony and acid tartrate of potash with sufficient distilled water to form a paste, and set aside for twenty-four hours. Then add the remainder of the water, and boil for a quarter of an hour, stirring frequently. Filter, and set aside the clear filtrate to crystallize. Pour off the mother liquid, evaporate to one-third, and set aside that more crystals may form. Dry the crystals on filtering paper at the temperature of the air.*

VINUM ANTIMONIALE—ANTIMONIAL WINE.—*Take of tartarated antimony,* 40 *grains; sherry,* 1 *pint. Dissolve.* Strength, two grains to the ounce.

UNGUENTUM ANTIMONII TARTARATI—OINTMENT OF TARTARATED ANTIMONY.—*Take of tartarated antimony, in fine powder,* ¼ *ounce; simple ointment,* 1 *ounce. Mix thoroughly.*

*Dose.*—Of the salt, as a diaphoretic or expectorant, from one-twelfth to one-sixth of a grain; as a nauseant and sudorific, a quarter to half-a-grain; as an emetic, one to three grains; as a sedative or contra-stimulant, half-a-grain to two or three grains, frequently repeated, and cautiously administered, so as not to produce vomiting. Of the wine as a diaphoretic or expectorant, ten to thirty minims; as a nauseant, one to two drachms; as an emetic, two drachms, repeated at short intervals, or in a full dose of half-an-ounce; but the wine is most useful in small doses. Of the ointment, thirty grains may be rubbed in and be repeated until an eruption appears, and the action may be kept up by anointing fresh parts as the eruption dies away. Tartar emetic may be applied for the same purpose in solution. As an emetic, its action is promoted by the addition of ipecacuanha, and its diaphoretic effects by combination with other diaphoretics, such as nitrate of potash. Opium may be combined with tartar emetic where it is desirable to combat its irritant properties, in cases in which opium is admissible.

*Therapeutics.*—Tartar emetic, even in small medicinal doses, has produced alarming and occasionally fatal effects in children. Adults, on the other hand, have been known to take large quantities with impunity, probably in consequence of the poison being removed by vomiting before it had produced either powerfully irritant or sedative effects. In over-doses, however, tartar emetic acts chiefly as an irritant, but also somewhat as a corrosive poison. The quantity necessary to a fatal result depends chiefly upon the vomiting and purging that ensue: an ounce has been taken followed by recovery; but, on the other hand, a drachm has proved fatal, and four grains have given rise to alarming symptoms even when free vomiting and purging followed. The symptoms observable in acute poisoning by tartar emetic, though variable, are usually the nauseous metallic taste of the poison, violent vomiting, with burning pain and constriction of the throat and œsophagus, difficulty of swallowing, and great thirst; pain in the stomach and bowels, and generally free purging; cramps in the limbs; cold clammy state of the skin, sometimes with a varioloid eruption; flushed, congested, or dusky countenance, husky voice, or complete inarticulation, extreme muscular depression, with small, weak, and frequent, or imperceptible pulse, delirium, death. There is, however, when prompt treatment is applied, a strong tendency to recover in acute poisoning by tartar emetic. Tartar emetic has frequently been employed for criminal purposes in small doses long continued, the intention being to induce the belief that the victim suffers from typhoid fever: the symptoms of chronic poisoning are chiefly nausea, vomiting, purging, small and frequent pulse, great muscular depression and weariness, a cold and clammy state of the surface, and general emaciation and exhaustion. ***Anti-***

*dote*, tannic acid or vegetable infusions containing it or the moist peroxide of iron.

Medicinally, tartar emetic is employed as a diaphoretic, expectorant, nauseant, sedative of the vascular system, contra-stimulant, emetic, counter-irritant, &c. It is contra-indicated in all cases of genuine debility, and as an emetic is unsuited to cases which will not bear depression, as in narcotic poisoning, or in cases of heart disease. It operates as an emetic, when given in sufficient doses, by whatever channel it is introduced into the system, whether by the stomach or rectum, or injected into a vein; and consequently it is sometimes administered by one of the latter methods to produce vomiting, and thereby to discharge impacted substances from the œsophagus, it induces vomiting chiefly by an action on the medulla, and not by mechanical irritation of the stomach. When given in quantities insufficient to cause vomiting, its administration is followed by a distinct diminution both in the force and frequency of the pulse, and likewise in the number of respirations; subsequently, it increases the activity of one or other of the secreting organs, acting either as a diaphoretic, diuretic, expectorant, or cholagogue. Tartar emetic has been given in continued, remittent, and intermittent fevers; in acute inflammatory attacks, such as pneumonia, in which it has been recommended in large doses, bronchitis, and pleurisy, but it should only be given in sthenic cases; in croup and laryngitis; in acute rheumatism; in inflammation and dropsies of the joints, in meningitis, in acute and chronic hydrocephalus, in insanity, in delirium tremens, in which it is beneficially combined with an opiate; to check certain internal hemorrhages by subduing the circulation; in gonorrhœa, orchitis, bubo, &c. It was formerly used to produce muscular prostration in strangulated hernia and dislocations, but is now superseded by chloroform; also to promote the dilatation of the os uteri in tedious labours, &c. Externally, it is employed as a counter-irritant, causing a pustular, varioloid eruption, which often causes great pain, and is sometimes troublesome to heal. It is used as a derivative in chronic diseases of the chest and throat, chronic affections of the joints, neuralgia, &c. &c.

**ARSENICUM** (As = 75)—Arsenic—occurs native in the form of *oxide* and *sulphide*, but more commonly it is in combination with other metals in the form of arseniurets, as of copper, cobalt, nickel, and iron. Metallic arsenic is of crystalline texture, very brittle, and of a steel-grey colour; it tarnishes when exposed to the air, falling into a greyish-black powder, volatilises when heated, and sublimes in closed vessels at a temperature below its fusing-point, giving off colourless fumes which have the odour of garlic. At a higher temperature it ignites, burns with a blue flame, and forms arsenious acid. It has a specific gravity of 5·75. It forms acids with oxygen.

**Acidum Arseniosum** ($As_2O_3$)—Arsenious Acid—Arsenicum Album—White Arsenic—White Oxide of Arsenic.

Commercial arsenious acid, which is obtained by roasting the arseniurets in a reverberatory furnace, is purified for medicinal purposes by the following process :—

*Take of arsenious acid of commerce,* 100 *grains. Introduce the commercial arsenious acid into a thin porcelain capsule of a circular shape; and having covered this as accurately as possible with a glass flask filled with cold water, apply the heat of a gas lamp. Sublimed arsenious acid will be found adhering to the bottom of the flask. Should a larger quantity be required, the commercial arsenious acid should be sublimed by the heat of a gas lamp or of burning charcoal, from a small Florence flask, the neck of which is passed into a second flask of larger size; and the flask containing the commercial arsenious acid should be furnished with a hood of sheet iron to counteract the cooling influence of the atmosphere. These processes should be conducted in the vicinity of a flue with a good draught, so as to carry off any vapours of arsenious acid which may escape.*

*Characters.*—Occurs as a heavy white powder, or in sublimed masses, which usually present a stratified appearance, caused by the existence of separate layers differing from each other in degrees of opacity. When slowly sublimed in a glass tube, it forms minute, brilliant, and transparent octahedral crystals. It is sparingly soluble in water, and its solution gives with ammonio-nitrate of silver a canary-yellow precipitate insoluble in water, but readily dissolved by ammonia and by nitric acid. Sprinkled on a red-hot coal, it emits an alliaceous odour.

LIQUOR ARSENICALIS — ARSENICAL SOLUTION — LIQUOR POTASSÆ ARSENITIS—FOWLER'S SOLUTION—TASTELESS AGUE DROP. —*Take of arsenious acid, carbonate of potash, of each* 80 *grains; compound tincture of lavender,* 5 *fluid drachms; distilled water, a sufficiency. Place the arsenious acid and the carbonate of potash in a flask with ten ounces of the water, and apply heat until a clear solution is obtained. Allow this to cool. Then add the compound tincture of lavender, and as much distilled water as will make the bulk one pint.*

*Characters.*—A reddish liquid, alkaline to test paper, and having the odour of lavender. Specific gravity, 1·009.

LIQUOR ARSENICI HYDROCHLORICUS — Hydrochloric solution of Arsenic—De Valengin's Solution.

*Take of arsenious acid, in powder,* 80 *grains; hydrochloric acid,* 2 *fluid drachms; distilled water, a sufficiency. Boil the arsenious acid with the hydrochloric acid and four ounces of the water until it is dissolved, then add distilled water to make the bulk up to one pint.*

*Characters.*—A colourless liquid, having an acid reaction. Specific gravity, 1·009.

This preparation is of the same strength as the Liquor Arsenicalis and nearly three times the strength of the original De Valengin's solution. Its action is similar to the Liquor Arsenicalis, but some practitioners believe it superior to the latter. De Valengin's solution is reputed to be less irritating than Fowler's solution, and consequently less apt to have its therapeutical uses interfered with by gastric derangement. This, however, is only true of the original solution, and not of the officinal one, which is of the same strength as the Liquor Arsenicalis—viz., four grains to the ounce.

*Dose.*—Of arsenious acid, a twentieth to an eighth of a grain, in pill or solution; of Liquor Arsenicalis, and of Liquor Arsenici Hydrochloricus, two to five, or cautiously up to ten minims. It is better to give the doses after meals, to avoid the risk of irritating the stomach.

*Therapeutics.*—Arsenious acid has so commonly been employed for criminal purposes, that an Act of Parliament was passed to prevent the sale of it unless coloured either by soot or indigo; and although a certain immunity from its effects is known to be obtained by the peasants in Styria, still we can regard it only as a powerful irritant poison when taken in over-doses. It is difficult to state the smallest dose that may prove fatal, as so much depends upon the condition of the stomach, as to food, at the time it is swallowed, and the vomiting which follows. Even medicinal doses sometimes give rise to alarming symptoms, and two grains in solution would possibly prove fatal; but, on the other hand, half-an-ounce has been taken, followed by free vomiting, without producing serious results. The poisonous effects of arsenic may also ensue upon its external application; several fatal cases have occurred from the employment of arsenious acid as an escharotic, even when used in very small quantity; also from its inhalation, from its use in the arts, from wall-papers, dresses, or sweets coloured with it. In acute poisoning by arsenic, the symptoms—which may supervene within a few minutes of the swallowing of the poison, or not until half-an-hour or an hour afterwards, or, though more rarely, not until several hours have elapsed—usually commence with a feeling of nausea, depression, and faintness, followed by severe burning pain in the stomach, which is increased by pressure ; this is followed by severe vomiting and purging, the vomited matters becoming dark, grumous, and often bloody, or yellowish or greenish from the admixture of bile, whilst the alvine evacuations frequently contain much blood and mucus. The urine is often scanty, high coloured, and mixed with blood ; its passage is attended with great pain, and the patient suffers more or less from uncontrollable priapism. There is a feeling of heat and constriction in the fauces and gullet ; intense thirst ; cramps in the legs ; the vomiting becomes more violent ; the abdomen becomes swollen and hard ; there is severe pain in the bowels, with tenesmus and continued purging ; the pulse is thready and irregular ; the surface of the body may be either hot, or cold and clammy ; the breathing is laboured, and as much as possible thoracic, so as to avoid movement of the abdomen, and pressure upon the inflamed stomach and bowels ; extreme prostration and faintness ; more or less of paralysis, with alternations of spasmodic movements, delirium, distressing hiccough, death. There are some very rare cases in which no symptoms of gastro-enteric inflammation are present, there is no pain in those regions, and the patient appears to sink from extreme nervous depression, death being ushered in either by syncope, coma, or convulsions, with intervals of delirium. Death may take place at any time from two hours to several days after swallowing the poison. *Treatment*, If vomiting is not caused freely by the poison, an emetic or stomach-pump, then administer moist peroxide of iron, or solution of dialysed iron, which does equally well. The former is best prepared by precipitation, by adding magnesia to a solution of the persulphate or chloride of iron, and give it freely. It forms an insoluble compound with arsenious acid ; and follow it with a brisk purgative. In slow or chronic arsenical poisoning, or when unduly continued as a medicine, there is usually considerable irritation of the mucous membrane of the alimentary canal, pain in the stomach and bowels, nausea or vomiting, and free purging, accompanied by tormina and tenesmus ; the tongue is furred and dry ; there is a burning sensation and a feeling of constriction in the fauces and gullet, with intense thirst, and occasional spitting of blood ; the pulse becomes wiry and rapid ; there is gradual emaciation, the eyes become red and suffused, and there is intolerance of light; the eyelids are puffy; and the face, and afterwards the limbs, become œdematous; there is frontal headache, nervous tremors or spasms, and a cutaneous vesicular eruption, termed *eczema arsenicale;* and, finally, death may be preceded by convulsions, or more rarely by coma, but usually there is a keen perception of suffering to the last. Arsenic exerts an antiseptic action on the tissues of persons who have died from its poisonous effects.

*Medicinally*, arsenious acid, administered internally, acts as a stomachic, a nervine tonic, antiperiodic, and alterative; and applied externally, as a stimulant, irritant, and escharotic. As a *tonic*, it is specially useful in nervous diseases of a spasmodic character, such as chorea (for which it is the best remedy known), spasmodic asthma, paralysis agitans, &c.; also in atonic dyspepsia, in chronic diarrhœa, where the bowels tend to move immediately after meals, and the stools consist of half-digested food. As an *antiperiodic*, it is second only to quinine, and is employed in the treatment of intermittent fever and various recurrent neuralgias, as tic-douloureux, hemicrania, &c. It is especially useful in chronic malarial poisoning given along with quinine. As an *alterative*, it is administered in various diseases of the skin, but it is most useful in the scaly class, as in the various species of psoriasis. It is often beneficial also in chronic eczema, impetigo, pompholyx, pemphygus; but it should only be administered in chronic skin eruptions, as it is apt to aggravate acute cases by its stimulant action, which is principally exerted on the superficial layer of the skin. It is likewise recommended in the treatment of chronic rheumatism. In rheumatoid arthritis, for which it was first proposed by Haygarth. In certain vesicular and ulcerative diseases of the mouth and throat, as in cancrum oris, lupus exedens, &c., it is found very beneficial.

Arsenic requires to be administered in carefully-increased doses, and to be stopped or at once diminished, if the conjunctivæ become œdematous or red, or if the bowels become loose. A silvery whiteness of the tongue, originally pointed out by Dr. Begbie, is one of the first signs that the system has been got fairly under the influence of arsenic. Externally, arsenious acid acts as a stimulant to the skin and is a not infrequent constituent of various cosmetics.

It is applied as an escharotic in the destruction of lupus exedens, cancerous masses, parts bitten by poisonous animals, onychia maligna, &c. Its use is not unattended by danger from absorption of the poison, but the risk is made much less if a strong paste is used in preference to a weak one. It acts by setting up destructive inflammation in the part, and if the irritation produced is sufficiently intense, absorption does not take place. Solutions of arsenic in glycerine, gr. i.-ii. in ℥j., form very effective antiparasitic applications in the treatment of ringworm both of the head and of the body, and also in other epizoic skin diseases.

## Sodæ Arsenias ($Na_2HAsO_4 7H_2O$)—Arseniate of Soda.

PREPARATION.—*Take of arsenious acid,* 10 *ounces; nitrate of soda,* 8½ *ounces; dried carbonate of soda,* 5½ *ounces; boiling distilled water,* 35 *fluid ounces. Reduce the dry ingredients separately to fine powder, and mix them thoroughly in a porcelain mortar. Put the mixture into a large clay crucible, and cover it with the lid. Expose to a full red heat, till all effervescence has ceased, and complete fusion has taken place. Pour out the fused salt on a clean flagstone, and as soon as it has solidified, and while it is still warm, put it into the boiling water, stirring diligently. When the salt has dissolved, filter the solution through paper, and set it aside to crystallize. Drain the crystals, and, having dried them rapidly on filtering paper, enclose them in stoppered bottles.*

*Characters.*—In colourless transparent prisms, soluble in water; the solution is alkaline, giving white precipitates with chloride of barium, chloride of calcium, and sulphate of zinc, and a brick-red precipitate with nitrate of silver, all of which are soluble in nitric acid.

LIQUOR SODÆ ARSENIATIS—SOLUTION OF ARSENIATE OF SODA.—*Take of arseniate of soda (rendered anhydrous by a heat not exceeding* 300°), 4 *grains; distilled water,* 1 *fluid ounce. Dissolve.* The salt crystallizes with a variable quantity of water; hence, for uniformity of strength, it is necessary to drive off all the water before preparing the solution.

*Dose.*—Of the crystallized salt, from one-sixteenth to one-eighth of a grain; of the anhydrous salt, one-twenty-fifth to one-twelfth of a grain, in pill or in solution; but it is rarely used otherwise than as the officinal solution, of which the dose is five to ten minims.

*Therapeutics.*—Arseniate of soda is much used on the Continent. It may be employed instead of arsenious acid or *liquor arsenicalis,* for it is often found that one preparation of arsenic will cause irritation when another will be readily borne, and the arseniate of soda is said to be less irritating than the arseniate of potash.

## Ferri Arsenias—Arseniate of Iron—Arseniate of Iron ($Fe_3As_2O_8$), partially oxidised.

PREPARATION.—*Take of sulphate of iron, 9 ounces; arseniate of soda, dried at 300°, 4 ounces; acetate of soda, 3 ounces; boiling distilled water, a sufficiency. Dissolve the arseniate and acetate of soda in two pints, and the sulphate of iron in three pints of the water, mix the two solutions, collect the precipitate which forms on a calico filter, and wash until the washings cease to be affected by a dilute solution of chloride of barium. Squeeze the washed precipitate between folds of strong linen in a screw press, and dry it on porous bricks in a warm-air chamber whose temperature shall not exceed* 100°.

*Characters.*—A tasteless amorphous powder of a green colour, insoluble in water, but readily dissolved in hydrochloric acid. This solution gives a copious light-blue precipitate with the yellow prussiate of potash, and a still more abundant one of a deeper colour with the red prussiate of potash. A small quantity boiled with an excess of caustic soda, and filtered, gives, when exactly neutralised by nitric acid, a brick-red precipitate on the addition of solution of nitrate of silver.

*Dose.*—From one-sixteenth to one-eighth of a grain, in pill.

*Therapeutics.*—Arseniate of iron acts as a tonic and alterative, and is employed in cases in which the double effects of iron and arsenic are desired, as in certain obstinate chronic skin diseases occurring in anæmic subjects; but the amount of iron the medicinal dose contains is probably much too small to be of therapeutical value, it is therefore simply another form of prescribing arsenic, and might be left out of the B. P. with no loss.

LIQUOR ARSENICI ET HYDRARGYRI IODIDI (not Officinal) —Solution of the Iodides of Arsenic and of Mercury (Donovan's Solution)—Liquor Arsenici et Hydrargyri Hydriodatis—Solution of the Hydriodates of Arsenic and of Mercury—Solution of the Iodo-Arsenite of Mercury.—Of this compound preparation each fluid drachm contains, either in the form of iodides or hydriodates, what is equal to one-twelfth of a grain of arsenic, one-fourth of a grain of mercury, and three-fourths of a grain of iodine. It may be given in doses of ten to twenty or thirty minims, sufficiently diluted, as an alterative in chronic cutaneous diseases, especially of the squamous kind, and those of syphilitic origin.

## HYDRARGYRUM ($Hg = 200$)—Mercury—Quicksilver.

*Characters and Tests.*—A metal, fluid at common temperatures, brilliantly lustrous, and easily divisible into spherical globules. Volatilises at a heat below that of visible redness, leaving no residue.

Its principal ore is the *sulphide* or *native cinnabar* (HgS), from which metallic mercury is obtained by distillation. Mercury is a brilliant, bluish-white or silvery-white, inodorous, and tasteless metal. It is fluid at ordinary temperature, freezes at—40°, and boils at 660°. It is very heavy, having a specific gravity, at 60°, of 13·56. It may contain lead, tin, zinc, bismuth, &c., as impurities. When pure, it is not affected when freely exposed to the air, but when contaminated it becomes covered with a grey powder, has a dull instead of a lustrous appearance, does not quickly form spherical globules when broken, and when run over white paper it leaves a trail behind.

*Therapeutics.*—Pure metallic mercury is inert in the system, and only becomes operative when it is oxidised and salified. This explains the action of such preparations as grey powder, blue pill, and ointment, all of which preparations, although made from metallic mercury, contain a variable proportion of oxide. All the compounds of mercury are more or less active, but they differ widely in the promptness and intensity of their action and local effect; this depends in great measure on their comparative solubility; possibly the sulphides are inert. When a mercurial preparation is given in medicinal doses, it sooner or later, according to circumstances, produces a group of symptoms which are collectively termed mercurial action, salivation, or mercurialism, and which no other substance can excite. It may be induced quickly by a single dose, or slowly by repeated small doses. In the former case it is violent in degree, in the latter it generally begins mildly, and can be usually regulated in degree by the will of the practitioner. The first symptoms of its action are to be looked for in the mouth, and are slight fœtor of the breath, and metallic taste; if its administration is continued, the gums become swollen, soft, and spongy, bleeding on the least abrasion, and there is a decided increase of saliva. If pushed further, these symptoms are all intensified. The gums are swollen and vascular, the tongue, submaxillary and parotid glands are enlarged, the teeth become loose, salivation is profuse, and the saliva is ropy and viscid, and there is a distinct febrile reaction of a low type. The parts may even ulcerate and slough, and necrosis of the jaw-bone has occurred, and death from exhaustion. During severe salivation emaciation goes on rapidly, and exudations frequently disappear. The blood becomes more fluid and watery, and its power of coagulation is impaired. Its solid constituents (WRIGHT) as albumen, fibrin, and red corpuscles are diminished. Hence it is termed an alterative. Sometimes the nervous system is chiefly affected, and mercurial palsy is the result, the symptoms resembling those of paralysis agitans. This condition is generally due to the inhalation of the vapour of mercury, as in workers in the metal. In others it appears to excite eczematous and other skin eruptions, or to produce a cahectic condition, with genuine debility of body and mind. The general indications in the treatment of mercurialism, after stopping the use of the drug, are to preserve the patient from exposure to cold and damp, without keeping the body too warm; to allay internal pain by opiates and soothing applications; to reduce inflammatory symptoms by the cautious use of local depletion and antiphlogistics; to allay febrile symptoms by mild saline purgatives or effervescing salines; to employ diffusible stimulants if there be great weakness or threatening syncope; to apply weak vegetable or mineral astringent lotions, or a lotion of chlorate of potash, to the mouth and throat when there is profuse salivation; to correct fetor of the breath by a well-diluted gargle or wash of chlorinated soda, or solution of permanganate of potash; to support the patient by bland, nutritious food; and finally, to facilitate the removal of the poison from the system, which may be promoted by the use of iodide of potassium. Mercurials are contra-indicated in all cases of genuine debility and impoverished states of the blood, in anæmia, scurvy, hectic, tuberculous and scrofulous diatheses, fatty degeneration of the heart, fatty or granular degeneration of the kidneys, &c. Patients are occasionally met with who manifest the symptoms of mercurialism after the most minute doses of any of the preparations; these are examples of the influence of idiosyncracy. Mercurialism is not easily established in children; the drug passes off by the bowels, giving the evacuations the characteristic *chopped spinach* appearance. Mercurials are said to act as alteratives, absorbents, antiphlogistics, antisyphilitics, &c. As antiphlogistics they are administered to control and diminish the inflammatory process, and to prevent exudation, or to stimulate the absorption of effused fibrin by rendering it less adhesive, and promoting its disintegration. But we do not think that in inflammation much reliance can be put on their action on the blood, because it would take some time before the blood would be altered in its composition so as to diminish inflammation. Nor do we think it would be advisable to push their administration to such an extent, as the remedy then might be worse than the disease. Any benefit which follows their use in these cases is more probably due to the increased functional activity of the glandular system by which a certain amount of counter-irritation and derivation of blood from other parts is produced. This helps to explain why mercury is not found suitable in acute inflammation of glandular structures, and why it is useful in inflammation of serous membranes, &c. As an antiphlogistic, then, mercury may be given in iritis, pericarditis, peritonitis, pleurisy, &c., at the outset of the attack, during the stage of exudation, and afterwards to diminish the inflammatory process, and to promote absorption of the effused products. It should not, however, be given in adynamic inflammation, or when the exudation is serous rather than fibrous. *As an antisyphilitic*—Formerly it was believed that mercury was a specific for syphilis, and it was frequently so rashly administered that the patient suffered from mercurial poisoning, as well as syphilis, and the symptoms of the latter disease were much aggravated. This at last began to be appreciated, and many have condemned its employment as being not only useless, but even injurious. This, however, the editor believes to be an extreme opinion, because, while admitting that it is not essential for the relief of syphilis, he has found it especially of value when the secondary eruptions are copious and disfigure the face, and in congenital syphilis of children. It is only the remedy for some of its symptoms, and is only one of the means that should be employed in treating the disease. They are given in combination with other purgatives in so-called bilious constipation, dyspepsia and headache, and in some forms of jaundice; in glandular swellings, in rheumatism, &c. &c. Mercurials may be administered by the stomach or by the rectum; by inhalation of the vapour; by fumigating the body (protecting the air passages) either with the dry or moist fumes; by simple inunction upon the skin, or by the endermic method of first removing the cuticle by a blister, and then dressing the wounded surface with the drug, or subcutaneously in the form of albuminate of corrosive sublimate. Infants may be brought under the influence of mercury by wrapping a flannel roller smeared with mercurial ointment round the body. Mercurials may be given in the mild form of minutely divided (and probably oxidised) mercury, as in grey powder, &c.; in the stronger form or protosalts; or in the still stronger form of persalts.

HYDRARGYRUM CUM CRETA — MERCURY AND CHALK (Grey powder).—*Take of mercury, by weight,* 1 *ounce; prepared chalk,* 2 *ounces. Rub the mercury and chalk in a porcelain mortar until metallic globules cease to be visible to the naked eye, and the mixture acquires a uniform grey colour.*

*Therapeutics.*—This is a heavy insoluble grey powder, containing chalk with finely divided and probably more or less oxidised mercury. It is given to children with rhubarb, or with carbonate of soda, as an alterative, antacid, and purgative, in diarrhœa, and cutaneous eruptions, depending upon irritability of the alimentary canal, and as an alterative in syphilis. It is the mildest of the mercurial preparations, and is suitable, also, as an alterative, for feeble adults. *Dose*, one to three, four, or more grains.

PILULA HYDRARGYRI—Mercurial Pill (Blue Pill).—*Take of mercury*, 2 *ounces; confection of roses*, 3 *ounces; liquorice root, in fine powder*, 1 *ounce. Rub the mercury with the confection of roses until metallic globules are no longer visible, then add the liquorice, and mix the whole well together.*

*Therapeutics.*—A soft bluish-black mass, containing finely divided and partially oxidised mercury. *Dose*, as an alterative, two or three grains, repeated at intervals according to circumstances; as a cholagogue, added to other purgatives, three to five grains; in doses of ten to fifteen grains, it acts alone as a purgative.

EMPLASTRUM HYDRARGYRI—Mercurial Plaster.—*Take of mercury*, 3 *ounces; olive oil*, 1 *fluid drachm; sublimed sulphur*, 8 *grains; lead plaster*, 6 *ounces. Heat the oil and add the sulphur to it gradually, stirring until they unite; with this mixture triturate the mercury until globules are no longer visible, then add the lead plaster previously liquified, and mix the whole thoroughly.*

EMPLASTRUM AMMONIACI CUM HYDRARGYRO—Ammoniac and Mercury Plaster.—*Take of ammoniacum*, 12 *ounces; mercury*, 3 *ounces; olive oil*, 1 *fluid drachm; sublimed sulphur*, 8 *grains. Heat the oil and add the sulphur to it gradually, stirring till they unite. With this mixture triturate the mercury, until the globules are no longer visible; and lastly, add the ammoniacum, previously liquified, mixing the whole carefully.*

*Therapeutics.*—These plasters are employed as stimulant and discutient applications to glandular enlargements, over the liver in chronic induration and enlargement; to indolent buboes, syphilitic nodes, &c.

LINIMENTUM HYDRARGYRI—Liniment of Mercury.—*Take of ointment of mercury*, 1 *ounce; solution of ammonia, liniment of camphor, of each* 1 *fluid ounce. Liquify the ointment of mercury in the liniment of camphor with a gentle heat; then add the solution of ammonia gradually, and mix with agitation.*

*Therapeutics.*—Employed as a stimulant and discutient application to indolent tumours, chronic enlargement of the joints, &c. It readily produces salivation.

SUPPOSITORIA HYDRARGYRI—Mercurial suppositories.

Preparation.—*Take of ointment of mercury,* 60 *grains; benzoated lard, white wax, of each* 20 *grains; oil of theobroma,* 80 *grains. Melt the benzoated lard, wax, and oil of theobroma with a gentle heat, then add the ointment of mercury, and having mixed all the ingredients thoroughly, without applying more heat, immediately pour the mixture, before it has congealed, into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.*

*Therapeutics.*—Found efficacious in destroying ascarides of the rectum, and as a local application for irritable or disordered conditions of its mucous membrane, which occasionally follow operative interference with it. It also presents a much easier method of bringing the system under the influence of mercury than inunction, when for any cause it is deemed inadvisable to administer the drug by the mouth.

UNGUENTUM HYDRARGYRI—Ointment of Mercury (Blue Ointment).—*Take of mercury, prepared lard, of each* 1 *pound; prepared suet,* 1 *ounce. Rub them together until metallic globules cease to be visible.*

*Therapeutics.*—A soft bluish-black ointment, containing finely divided and probably partially oxidised mercury. It is employed as a discutient, to indolent tumours, and, in conjunction with the internal use of mercurials, to produce salivation; for the latter purpose it is rubbed into the most tender parts of the skin, as on the inner sides of the thighs, into the axillæ, &c., or it may be applied endermically to a blistered surface. It has been recommended as an application over deep-seated acute inflammations, in orchitis, in erysipelas, &c.

UNGUENTUM HYDRARGYRI COMPOSITUM—Compound Ointment of Mercury.

Preparation.—*Take of ointment of mercury,* 6 *ounces; yellow wax, olive oil, of each* 3 *ounces; camphor,* 1½ *ounce. Melt the wax with a gentle heat, and add the oil; then, when the mixture is nearly cold, add the camphor in powder, and the ointment of mercury, and mix the whole thoroughly together.*

*Therapeutics.*—This ointment combines the medicinal properties of the mercurial ointment and camphor. The wax and oil are added to give it body, as the combination of camphor with mercurial ointment is too fluid for convenient use. It is used as a stimulant deobstruent ointment in cases of swollen scrofulous glands, chronic buboes, &c.

**Hydrargyri Oxidum Nigrum**—($Hg_2O$)—Black Oxide of Mercury—Suboxide of Mercury—Protoxide of Mercury—is a dark greyish-black tasteless, and inodorous powder, which is insoluble in water, and is decomposed by the influence of light and air, being converted into metallic mercury and oxide. It may be prepared by throwing calomel into lime water, whereby the subchloride of mercury is precipitated as suboxide, chloride of calcium being formed in solution, $Hg_2Cl_2+CaO=Hg_2O+CaCl_2$. This constitutes

LOTIO HYDRARGYRI NIGRA—Black Mercurial Lotion—Black Wash.—*Take of subchloride of mercury,* 30 *grains; solution of lime,* 10 *fluid ounces. Mix.*

*Therapeutics.*—Black wash, though a standard preparation in all hospitals, was never before officinal. Its name sufficiently explains its appearance. It is employed as a mild alterative application to chancres and other syphilitic sores, and also to a variety of non-syphilitic sores, such as cancrum oris, foul and indolent ulcers, &c. The black oxide is sometimes used for fumigation, but is never administered internally. An ointment is sometimes prepared from it, which is used for purposes similar to those to which black wash is applied.

**Hydrargyri Oxidum Rubrum** ($HgO$)—Red Oxide of Mercury—Red Precipitate.

PREPARATION.—*Take of mercury, by weight,* 8 *ounces; nitric acid,* 4½ *fluid ounces; water,* 2 *fluid ounces. Dissolve half the mercury in nitric acid diluted with the water, evaporate the solution to dryness, and with the dry salt thus obtained triturate the remainder of the mercury, until the two are uniformly blended together. Heat the mixture in a porcelain dish with repeated stirring, until acid vapours cease to be evolved, and, when cold, enclose the product in a bottle.*

*Characters.*—An orange-red powder, readily dissolved by hydrochloric acid, yielding a solution which, with caustic potash added in excess, gives a yellow precipitate, and with solution of ammonia a white precipitate.

**Hydrargyri Oxidum Flavum**—$HgO$—Yellow Oxide of Mercury.

EPARATION.—*Take*
*rectified spirit,*
*mortar, oc*
*spirit, an*
*sible, a*
*sho*

SUBCHLORIDI COMPOSITA—
OF MERCURY—PLUMMER'S PILL.—
*urated antimony, of each,* 1 *ounce;*
*; castor oil,* 1 *fluid ounce, or a*
*of mercury with the antimony,*
*il, and beat the whole into a*

CHLORIDI—OINTMENT
*chloride of mercury,* 80

r
, noth
a yellow
red, while glob
the tube.

One to three grains (one-sixth
ren), in pill; care being taken to ascerta
red iodide, which would cause alarming symptoms.
one part to eight of lard. Iodide of potassium migh
vert it into the red iodide, and therefore should not be given

**to two grains; as**
**of mercurialism,**
**every hour, or**
**alomel pill, as**
**; there is a**
**e grains of**
**alone or**
**pill), or**
**may**
**he**

*Therapeutics.*—Green iodide of mercury acts in over-doses as an irritant poison, and in medicinal doses as an alterative and stimulant. It is employed in syphilitic and scrofulous affections, has proved highly useful in sarcinous vomiting, when this was unattended by malignant disease, and is used in a variety of chronic cutaneous diseases, &c. Externally, it is applied over the seat of chronic inflammations, over the region of the liver in chronic induration of that organ, &c. It may also cause salivation.

## Hydrargyri Iodidum Rubrum ($HgI_2$)—Red Iodide of Mercury.

PREPARATION.—*Take of perchloride of mercury,* 4 *ounces; iodide of potassium,* 5 *ounces; boiling distilled water,* 4 *pints. Dissolve the perchloride of mercury in* 3 *pints, and the iodide of potassium in the remainder of the water, and mix the two solutions. When the temperature of the mixture has fallen to that of the atmosphere, decant the supernatant liquor from the precipitate, and having collected the latter on a filter, wash it twice with cold distilled water, and dry it at a temperature not exceeding* 212°.

*Characters.*—A crystalline powder of a vermilion colour, becoming yellow when gently heated over a lamp on a sheet of paper, almost insoluble in water, dissolves sparingly in alcohol, but freely in ether, or in an aqueous solution of iodide of potassium. When digested

PREPARATION.—*Take of perchloride of mercury, 4 ounces; solution of soda, 2 pints; distilled water, a sufficiency. Dissolve the perchloride of mercury in four pints of distilled water, aiding the solution by the application of heat, and add this to the solution of soda. Stir them together; allow the yellow precipitate to subside; remove the supernatant liquor by decantation; thoroughly wash the precipitated oxide on a calico filter; and finally dry it by the heat of a water-bath.*

*Characters and Tests.*—A yellow powder readily dissolved by hydrochloric acid, yielding a solution which, with solution of ammonia, gives a white precipitate. It is entirely volatilised when heated to incipient redness; being resolved into oxygen gas and the vapour of mercury.

*Therapeutics.*—The yellow and red oxides are identical in chemical composition. The yellow oxide, when long kept, loses its bright colour and becomes greyish, which is probably due to partial reduction. This oxide is used like the red oxide, and from being in a finer state of division, is preferred by some.

LOTIO HYDRARGYRI FLAVA—YELLOW MERCURIAL LOTION—YELLOW WASH.—*Take of perchloride of mercury, 18 grains; solution of lime, 10 fluid ounces. Mix.*

*Therapeutics.*—Yellow Wash is simply peroxide of mercury suspended in the liquid. It is employed for purposes similar to those for which the red precipitate ointment is used.

UNGUENTUM HYDRARGYRI OXIDI RUBRI—OINTMENT OF RED OXIDE OF MERCURY—Unguentum Hydrargyri Nitrico-Oxidi, *Lond.* (Red Precipitate Ointment).—*Take of red oxide of mercury in very fine powder, 62 grains; yellow wax, 1¼ ounce; oil of almonds, ¾ ounce. Melt the wax at a gentle heat, mix the oil with it, and when the mixture is nearly cold, add the oxide of mercury, and mix the whole thoroughly together.*

*Therapeutics.*—Red oxide of mercury has been given internally in doses of from one-twelfth of a grain upwards, but in consequence of its uncertain character and its irritant poisonous properties, it is very rarely administered. Externally, it is applied, either sprinkled in powder upon the part, or in the form of ointment, as a caustic to unhealthy granulations, chronic indolent ulcers, soft warts, ophthalmia tarsi, chronic conjunctivitis, &c. It may cause salivation, and, therefore, ought to be applied with care.

**Hydrargyri Iodidum Viride**—(HgI)—Green Iodide of Mercury—Proto-iodide of Mercury—Iodide of Mercury.

PREPARATION.—*Take of mercury, by weight,* 1 *ounce; iodine,* 278 *grains; rectified spirit, a sufficiency. Rub the iodine and mercury in a porcelain mortar, occasionally moistening the mixture with a few drops of the spirit, and continue the trituration until metallic globules are no longer visible, and the whole assumes a green colour. The product thus obtained should be dried in a dark room on filtering paper, by simple exposure to the air, and preserved in an opaque bottle.*

*Characters and Tests.*—A dull green powder, insoluble in water, which darkens in colour upon exposure to light. When it is shaken in a tube with ether, nothing is dissolved. Gradually heated in a test-tube, it yields a yellow sublimate, which, upon friction, or after cooling, becomes red, while globules of metallic mercury are left in the bottom of the tube.

*Dose.*—One to three grains (one-sixth to one-half of a grain to children), in pill; care being taken to ascertain its freedom from the red iodide, which would cause alarming symptoms. As an ointment, one part to eight of lard. Iodide of potassium might possibly convert it into the red iodide, and therefore should not be given with it.

*Therapeutics.*—Green iodide of mercury acts in over-doses as an irritant poison, and in medicinal doses as an alterative and stimulant. It is employed in syphilitic and scrofulous affections, has proved highly useful in sarcinous vomiting, when this was unattended by malignant disease, and is used in a variety of chronic cutaneous diseases, &c. Externally, it is applied over the seat of chronic inflammations, over the region of the liver in chronic induration of that organ, &c. It may also cause salivation.

**Hydrargyri Iodidum Rubrum** ($HgI_2$)—Red Iodide of Mercury.

PREPARATION.—*Take of perchloride of mercury,* 4 *ounces; iodide of potassium,* 5 *ounces; boiling distilled water,* 4 *pints. Dissolve the perchloride of mercury in* 3 *pints, and the iodide of potassium in the remainder of the water, and mix the two solutions. When the temperature of the mixture has fallen to that of the atmosphere, decant the supernatant liquor from the precipitate, and having collected the latter on a filter, wash it twice with cold distilled water, and dry it at a temperature not exceeding* 212°.

*Characters.*—A crystalline powder of a vermilion colour, becoming yellow when gently heated over a lamp on a sheet of paper, almost insoluble in water, dissolves sparingly in alcohol, but freely in ether, or in an aqueous solution of iodide of potassium. When digested with solution of soda, it assumes a reddish-brown colour, and the fluid, cleared by filtration and mixed with solution of starch, gives a blue precipitate on being acidulated with nitric acid.

UNGUENTUM HYDRARGYRI IODIDI RUBRI—Ointment of Red Iodide of Mercury.—*Take of red iodide of mercury, in fine powder,* 16 *grains; simple ointment,* 1 *ounce. Mix thoroughly.*

*Dose.*—One-sixteenth, very cautiously increased to a quarter, of a grain, in pill or in solution, with iodide of potassium.

*Therapeutics.*—Red iodide of mercury acts in over-doses as a powerful irritant poison, resembling corrosive sublimate; and even in medicinal doses it may cause great irritation and salivation. Externally, it acts as a powerful caustic, causing inflammation of the skin when applied to it. In medicinal doses it is alterative, stimulant, and deobstruent. It is employed in syphilitic and strumous affections, in a variety of cutaneous diseases, in epilepsy, in syphilitic rheumatism, in chronic glandular enlargements, &c. Externally, it has been used in bronchocele, in lupus, ophthalmia tarsi, chronic glandular enlargements, &c. Its application to broken surfaces requires great caution, and causes very severe pain.

## **Hydrargyri Subchloridum** ($HgCl$)—Subchloride of Mercury—Calomel.

*Preparation.*—Take of sulphate of mercury, 10 ounces; mercury, 7 ounces; chloride of sodium, dried, 5 ounces; boiling distilled water, a sufficiency. Moisten the sulphate of mercury with some of the water, and rub it and the mercury together until globules are no longer visible; add the chloride of sodium, and thoroughly mix the whole by continued trituration. Sublime by a suitable apparatus into a chamber of such size that the calomel, instead of adhering to its sides as a crystalline crust, shall fall as a fine powder on its floor. Wash this powder with boiling distilled water until the washings cease to be darkened by a drop of sulphide of ammonium. Finally, dry at a heat not exceeding 212°, and preserve in a jar or bottle impervious to light.

*Characters.*—A dull-white, heavy, and nearly tasteless powder, rendered yellowish by trituration in a mortar; insoluble in water, spirit, or ether. Digested with solution of potash, it becomes black; and the clear solution, acidulated with nitric acid, gives a copious white precipitate with nitrate of silver. Contact with hydrocyanic acid also darkens its colour.

PILULA HYDRARGYRI SUBCHLORIDI COMPOSITA—COMPOUND PILL OF SUBCHLORIDE OF MERCURY—PLUMMER'S PILL.—*Take of subchloride of mercury, sulphurated antimony, of each,* 1 *ounce; guaiacum resin, in powder,* 2 *ounces; castor oil,* 1 *fluid ounce, or a sufficiency. Triturate the subchloride of mercury with the antimony, then add the guaiacum resin and castor oil, and beat the whole into a uniform mass.*

UNGUENTUM HYDRARGYRI SUBCHLORIDI—OINTMENT OF SUBCHLORIDE OF MERCURY.—*Take of subchloride of mercury,* 80 *grains; prepared lard,* 1 *ounce. Mix thoroughly.*

*Dose.*—Of calomel, as an alterative, half-a-grain to two grains; as a purgative, two to six grains; to produce symptoms of mercurialism, one grain, combined with a sixth of a grain of opium, every hour, or in larger doses at longer intervals. Of the compound calomel pill, as an alterative and diaphoretic, five to ten or more grains; there is a grain each of calomel and of sulphurated antimony in five grains of the pill. Calomel may be given in pill or in powder, either alone or in combination with other alteratives (as in the compound pill), or purgatives.

*Therapeutics.*—Calomel acts as a mild but sure mercurial, and may usually be taken in very large doses with impunity; but, on the other hand, so small a quantity as five grains has caused fatal salivation, and deaths have followed the administration of comparatively small quantities. In small doses, calomel acts as an alterative, and as such is given in a variety of cases, including syphilitic and other chronic skin diseases, affections of the liver, glandular enlargements, &c. As an antiphlogistic, it is given in febrile and inflammatory affections; as a purgative, it is usually given in combination with other cathartics, whose effects it tends to promote by stimulating the liver and intestinal glands to increased activity, and is employed as such in sluggish states of the liver, with constipation, jaundice, at the outset of inflammatory diseases, &c. It does not, however, act directly on the liver (BENNET, RUTHERFORD, and VIGNAL), but indirectly it increases the elimination of bile from the intestinal canal, and hence it is especially useful in unloading the portal circulation in various derangements of that organ whether acute or chronic. In hot climates it is used in large doses (15-20 grains) as a sedative, as in cholera, dysentery, yellow fever, &c. Plummer's pill is a favourite alterative remedy employed in syphilitic and other chronic skin diseases, in chronic rheumatism, &c. Calomel ointment is applied to chronic cutaneous diseases, &c. Calomel is also frequently added in minute quantity to other remedies, as diaphoretics, diuretics, anthelmintics, &c., to promote their special effects.

**Hydrargyri Perchloridum** ($HgCl_2$)—Perchloride of Mercury—Corrosive Sublimate.

PREPARATION.—*Take of sulphate of mercury,* 20 *ounces; chloride of sodium, dried,* 16 *ounces; black oxide of manganese, in fine powder,* 1 *ounce. Reduce the sulphate of mercury and the chloride of sodium each to fine powder, and having mixed them and the oxide of manganese thoroughly by trituration in a mortar, put the mixture into an apparatus adapted for sublimation, and apply sufficient heat to cause vapours of perchloride of mercury to rise into the less heated part of the apparatus which has been arranged for their condensation.*

*Characters.*—In heavy colourless masses of prismatic crystals, possessing a highly acrid metallic taste, more soluble in alcohol, and still more so in ether than in water. Its aqueous solution gives a yellow precipitate with caustic potash, a white precipitate with ammonia, and a curdy white precipitate with nitrate of silver.

*Dose.*—From one-sixteenth to one-eighth of a grain, in pill or solution, taken after meals. Externally, from a quarter of a grain to a grain to each ounce of the vehicle, as a lotion.

LIQUOR HYDRARGYRI PERCHLORIDI—Solution of the Perchloride of Mercury.—*Take of perchloride of mercury, chloride of ammonium, of each,* 10 *grains; distilled water,* 1 *pint. Dissolve.*

The chloride of ammonium is used simply to increase the solvent power of the water. It is a very useful form for administering the perchloride. One fluid drachm contains one-sixteenth of a grain of the salt. The dose is from one to two fluid drachms thrice a-day.

*Therapeutics.*—Corrosive sublimate in over-doses acts as a powerful corrosive irritant poison. Three grains have destroyed the life of a child, but much larger doses have been followed by recovery, either in consequence of free spontaneous vomiting, or of the employment of remedial measures. The promptness and energy of the poison will depend upon the state of the stomach with respect to food; if it be swallowed after a meal, comparatively little injury may ensue if it be immediately expelled; but when taken on an empty stomach, even small medicinal doses are apt to cause great irritation. Death may follow a poisonous dose at any time between three to five or ten hours and five or more days after swallowing it. The symptoms attending acute poisoning by corrosive sublimate are manifested immediately after it is taken, and are more or less as follows :—There is the strong nauseous metallic taste of the poison, a burning heat and a feeling of constriction in the throat and gullet, extending to the stomach, causing painful and difficult swallowing and breathing ; the tongue is contracted, and its surface, in common with that of the whole cavity of the mouth, is whitened, and occasionally there are early symptoms of salivation, with swelling of the tongue, gums, and lips ; vomiting then follows, and causes great suffering, the vomited matters being mixed with stringy mucus and blood ; there is usually intense pain in the region of the stomach, and the whole surface of the abdomen is intolerant of pressure ; there is severe purging, the evacuations containing more or less of mucus and blood ; the urinary organs are often implicated, the urine being scanty, and its passage very painful ; there is great nervous depression ; the pulse is small, weak, and frequent, thready and irregular ; the face is often flushed and swollen, at other times shrunken, pale, and anxious, and the surface of the body is cold and clammy ; death may be preceded by convulsions, or by stupor, or fatal syncope may occur without them. If the patient survive a few days, salivation, ulceration of the mouth, severe dysenteric purging, and the symptoms arising from destruction of portions of the tissues of the alimentary canal, may ensue. Poisoning by corrosive sublimate may take place slowly, by the administration of small doses, and serious effects may follow its external use when applied to broken surfaces. The symptoms of acute poisoning by corrosive sublimate are generally more promptly manifested, the taste of the poison is more marked, the heat and constriction of the gullet are more intense, and are present before vomiting commences, the evacuations are more frequently mixed with blood, and the urinary organs are more implicated than in poisoning by *arsenic*. *Treatment*, albumen as it forms a sparingly soluble compound, but soluble in excess of albumen, give therefore white of eggs or wheaten flour, milk or protochloride of tin, failing albumen, opiates and demulcents, and treat the symptoms of salivation as they arise.

*Medicinally*, corrosive sublimate acts as an alterative, seldom producing salivation ; it should be given after meals, in order to avoid the irritation which it is apt to cause when given on an empty stomach, and if it still cause irritation, it may be combined with a little opium. It is given in secondary syphilis, in a variety of chronic syphilitic and other diseases of the skin, in strumous affections, chronic rheumatism, ophthalmia, arthritis, periosteal affections of a syphilitic origin, &c. Externally, it acts as an escharotic, and is not without danger, either from the violence of its local effects, or in consequence of its absorption; it has been employed as an alterative lotion, collyrium, or injection, it has been found beneficial in cutaneous diseases, ophthalmia, prurigo, &c.

**Hydrargyrum Ammoniatum** ($NH_2HgCl$)—Ammoniated Mercury—Hydrargyri Ammonio-Chloridum—Ammonio-Chloride of Mercury—Hydrargyri Præcipitatum Album—White Precipitate.

PREPARATION.—*Take of perchloride of mercury,* 3 *ounces; solution of ammonia,* 4 *fluid ounces; distilled water,* 3 *pints. Dissolve the perchloride of mercury in the water with the aid of a moderate heat; mix the solution with the ammonia, constantly stirring; collect the precipitate on a filter, and wash it well with cold distilled water until the liquid which passes through ceases to give a precipitate when dropped into a solution of nitrate of silver acidulated by nitric acid. Lastly, dry the product at a temperature not exceeding* 212°.

*Characters.*—An opaque white powder, on which cold water, alcohol, and ether have no action. Digested with caustic potash, it evolves ammonia, acquiring a pale-yellow colour, and the fluid, filtered, and acidulated with nitric acid, gives a white precipitate with nitrate of silver. Boiled with a solution of chloride of tin, it becomes grey, and affords globules of metallic mercury.

UNGUENTUM HYDRARGYRI AMMONIATI—OINTMENT OF AMMONIATED MERCURY—*Unguentum præcipitati albi,* Ed.—*Take of ammoniated mercury,* 62 *grains; simple ointment,* 1 *ounce. Mix thoroughly.*

*Therapeutics.*—Ammoniated mercury acts as a powerful irritant poison; it is not used internally. Externally, it is employed in the form of the *white precipitate* ointment as an application in a variety of skin diseases, more especially those of an eczematous nature, in ophthalmia tarsi, to destroy pediculi, &c.

**Liquor Hydrargyri Nitratis Acidus**—Acid Solution of Nitrate of Mercury—Nitrate of Mercury ($Hg2NO_3$) in Solution in Nitric Acid.

PREPARATION.—*Take of mercury,* 4 *ounces; nitric acid,* 5 *fluid ounces; distilled water,* 1½ *fluid ounce. Mix the nitric acid with water in a flask; and dissolve the mercury in the mixture without the application of heat. Boil gently for fifteen minutes, cool, and preserve the solution in a stoppered bottle.*

*Characters.*—A colourless and strongly acid solution, which gives a yellow precipitate with solution of potash added in excess. If a crystal of sulphate of iron be dropped into it, in a little time the salt of iron, and the liquid in its vicinity, acquire a dark colour.

*Therapeutics.*—Acid solution of nitrate of mercury acts as a powerful and energetic caustic; it is never given internally, nor should it be applied to extensive surfaces, as it is apt to be absorbed and cause salivation, besides giving rise to severe local pain. During its application, the surrounding parts must be carefully protected. It has been employed in lupus, and to other aggravated chronic skin disease, to phagedenic, syphilitic, cancerous, and other spreading ulcerations, to ulcerations of the cervix uteri, to primary chancre, &c.

UNGUENTUM HYDRARGYRI NITRATIS—OINTMENT OF NITRATE OF MERCURY—UNGUENTUM CITRINUM, Ed.—*Take of mercury, by weight,* 4 *ounces; nitric acid,* 12 *fluid ounces; prepared lard,* 15 *ounces; olive oil,* 32 *fluid ounces. Dissolve the mercury in the nitric acid with the aid of a gentle heat; melt the lard in the oil, by a steam or water-bath, in a porcelain vessel capable of holding six times the quantity; and while the mixture is hot, add the solution of mercury, also hot, mixing them thoroughly. If the mixture do not froth up, increase the heat till this occurs. Keep it stirred until it is cold.*

*Therapeutics.*—Ointment of nitrate of mercury, or citrine ointment, acts somewhat as an irritant when employed of officinal strength, and also as a stimulant and alterative. It may be diluted to any degree by the addition of prepared lard. It is used, sufficiently diluted, as an eye salve in chronic ophthalmia, in ophthalmia tarsi, and in granular conjunctivitis; it is also applied to a variety of chronic skin diseases, to indolent ulcers, &c.

HYDRARGYRI SULPHURETUM (HgS) (not officinal)—Sulphuret of Mercury—Red Sulphuret of Mercury—Cinnabar—Vermilion—occurs native, and is the ore from which metallic mercury is chiefly extracted. It occurs either as a tasteless, inodorous, brilliant red powder, permanent in air, and insoluble in water and alcohol, or as a dark red coloured crystalline mass. Cinnabar acts as an alterative, but is rarely used internally; externally it is employed in quantities of from twenty to fifty or sixty grains, to fumigate ulcers and certain skin diseases; it has also been used to fumigate the throat, but the sulphurous acid generated at the time is exceedingly irritating, so that the suboxide of mercury is preferable.

HYDRARGYRI SULPHAS ($HgSO_4$)—Sulphate of Mercury.

Preparation.—*Take of mercury, by weight,* 20 *ounces; sulphuric acid,* 12 *fluid ounces. Heat the mercury with the sulphuric acid in a porcelain vessel, stirring constantly, until the metal disappears, then continue the heat until a dry white salt remains.*

*Characters.*—A white crystalline heavy powder, rendered yellow by affusion of water. Entirely volatilised by heat.

It is employed in the preparation of corrosive sublimate and calomel, and is not given as a remedy.

**ARGENTUM** (Ag = 108—Silver)—the Luna or Diana of the alchemist, ☽—occurs native either massive, arborescent, or crystallized, but is seldom pure, also in the form of sulphide and chloride, and alloyed with other metals. It may be obtained from argentiferous sulphide of lead by roasting and cupellation, or by reducing other sulphides of silver by amalgamation. Silver is an exceedingly brilliant, white, malleable and ductile metal, having a specific gravity of 10·5. It melts at a bright red heat, said to be 1873°, and when in a state of fusion is extremely brilliant. It does not readily oxidise, but quickly tarnishes by the action of sulphuretted hydrogen.

**ARGENTUM PURIFICATUM**—Refined Silver—Pure metallic silver.

**Argenti Nitras** ($AgNO_3$)—Nitrate of Silver—Lunar Caustic.

Preparation.—*Take of purified silver,* 3 *ounces; nitric acid,* 2½ *fluid ounces; distilled water,* 5 *fluid ounces. Add the nitric acid and the water to the silver in a flask, and apply a gentle heat till the metal is dissolved. Decant the clear liquor from any black powder which may be present, into a porcelain dish, evaporate, and set aside to crystallize; pour off the liquor, and again evaporate and crystallize. Let the crystals drain in a glass funnel, and dry them by exposure to the air, carefully avoiding the contact of all organic substances. To obtain the nitrate in rods, fuse the crystals in a capsule of platinum or thin porcelain, and pour the melted salt into proper moulds. Nitrate of silver must be preserved in bottles, carefully stoppered.*

*Characters.*—In colourless tabular crystals, the primary form of which is the right rhombic prism, or in white cylindrical rods, soluble in distilled water, and in rectified spirits; the solution gives with hydrochloric acid a curdy white precipitate, which darkens by exposure to light, and is soluble in solution of ammonia. A small fragment heated on charcoal with a blow-pipe, first melts, and then deflagrates, leaving behind a dull white metallic coating.

*Dose.*—A quarter of a grain to two or three grains, made into pill with a vegetable extract. It is frequently made into pills with bread crumb, and it is doubtful whether the chloride of sodium contained in the bread interferes with the action of the remedy. Lotions and washes of nitrate of silver are made of various strengths, from one or two to twenty or more grains to the ounce of distilled water. Fused *lunar caustic* is used in the solid form externally.

*Therapeutics.*—Nitrate of silver in over-doses acts a powerful corrosive poison; but there are very few cases of fatal poisoning by it on record. *Antidotes*, common salt to precipitate the chloride, demulcent drinks to facilitate vomiting; subsequent treatment according to circumstances. Medicinally it acts as a sedative, alterative, astringent, antispasmodic, and tonic, when given internally; and as an alterative, astringent, stimulant, vesicant, and easily manageable mild caustic, when applied externally. When given internally for a considerable time, it is apt to cause a bluish, leaden, or indigo discoloration of the skin, which is permanent, and which—although it is said to be removable by the long-continued employment of iodide of potassium, bitartrate of potash, or dilute nitric acid—is generally believed to be indelible. Warning is said to be given of the approach of this discoloration by the appearance of a dark line along the edges of the gums; and it has been further stated that the discoloration does not supervene until the medicine has been continued upwards of three months. The cases for which it has been given internally are chiefly:—In affections of the alimentary canal, such as dyspepsia, nervous irritability of the stomach, ulcerations of the stomach, gastrodynia, pyrosis, obstinate chronic diarrhœa, acute and chronic dysentery and cholera, enemata containing the remedy being also employed in the cases in which its local application by such means is available; in spasmodic diseases, such as epilepsy, chorea, chronic hooping-cough, and spasmodic asthma; in locomotor ataxia, &c.; but as to its action as a nervine tonic our knowledge is purely empirical. Externally, either in lotions of various strengths, or in the solid form, it has been used chiefly in affections of the eye, such as catarrhal, purulent, scrofulous or gonorrhœal ophthalmia, ophthalmia tarsi, ulceration and opacity of the cornea, &c.; in affections of the mouth, throat, and larynx, such as relaxed, ulcerated, and malignant sore throat, enlargement and ulceration of the tonsils, aphthous ulcerations, laryngitis, croup, diphtheria, ptyalism, &c.; in affections of the genito-urinary organs, either in the solid form or by injections, such as leucorrhœa, ulcerations of the os and cervix uteri, cancer of the uterus, chronic inflammation of the neck of the uterus, pruritus pudendi, as a topical application to the os uteri in amenorrhœa, in chronic inflammation of the bladder, in spermatorrhœa, in gonorrhœa, primary chancres, &c.; in external affections, such as a variety of skin diseases, the pustules of small-pox, erysipelas, and other inflamed surfaces, the bites of rabid and poisonous animals, dissection wounds, unhealthy ulcers and granulations, chapped nipples, warts, corns, a variety of tumours and enlarged glands, &c.; to arrest the bleeding of leech bites and minute vessels, &c.

### Argenti Oxidum ($Ag_2O$)—Oxide of silver.

PREPARATION.—*Take of nitrate of silver, in crystals, ½ ounce; solution of lime, 3½ pints; distilled water,* 10 *fluid ounces. Dissolve the nitrate of silver in four ounces of the distilled water, and, having poured the solution into a bottle containing the solution of lime, shake the mixture well, and set it aside to allow the deposit to settle. Draw off the supernatant liquid, collect the deposit on a filter, wash it with the remainder of the distilled water, and dry it at a heat not exceeding* 212°. *Keep it in a stoppered bottle.*

*Characters.*—An olive-brown powder, which at a low red heat gives off oxygen, and is reduced to the metallic state. It dissolves completely in nitric acid without the evolution of any gas, forming a solution which has the characters of nitrate of silver.

When recently prepared, this occurs as an olive-brown hydrated oxide, which gradually loses its water and becomes darker coloured as it is kept, being by long exposure to light decomposed into oxygen and suboxide, and finally reduced to metallic silver. It is an inodorous, tasteless powder, slightly soluble in water, the solution having an alkaline reaction.

*Dose.*—Half-a-grain to one or two grains, in pill; externally, as an ointment, sixty grains to the ounce of lard.

*Therapeutics.*—Oxide of silver acts in the manner of the nitrate, but is very much milder in its topical effects, and is said to be less liable to cause discoloration of the skin, hence it ought to be prescribed in preference to the nitrate as a nervine tonic, its local action being almost *nil.* It has been recommended in the same cases as the nitrate, but is said to have a special action upon the uterus, and to be of use in menorrhagia, dysmenorrhœa, leucorrhœa, &c. In the form of ointment, it is applied, by means of a bougie, in gonorrhœa and gleet, and externally to venereal ulcers, &c.

**AURUM** (Au = 196·5)—Gold.—*Appendix.*—Fine gold, in mass or leaf. The test solution of the terchloride is prepared by dissolving gold in nitro-hydrochloric acid, used as a test for atropine.

# PART III.—ORGANIC MATERIA MEDICA.

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## DIVISION I.—VEGETABLE KINGDOM.

## CLASS I.—EXOGENÆ.

### SUB-CLASS I.—THALAMIFLORÆ.

**RANUNCULACEÆ**—The Crow-foot Order—Buttercup Order—Herbs, rarely shrubs, inhabiting cool moist climates in Europe and North America, and also met with at considerable elevations within the tropics. Many of the plants are poisonous, and have narcotico-acrid and sedative properties. Officinal plants, *Aconitum Napellus*, *Podophyllum peltatum.*

**Aconitum Napellus**—Aconite—Monkshood, Wolfsbane, or Blue-rocket. Officinal parts:—1. The fresh leaves and flowering tops; gathered, when about one-third of the flowers are expanded, from plants cultivated in Britain. 2. *Aconiti Radix:* the root, dried; imported from Germany, or cultivated in Britain, and collected in the winter or early spring before the leaves have appeared. 3. *Aconitia:* an alkaloid $C_{33}H_{43}NO_{12}$, obtained from aconite root.

*Botany.*—Perennial herb. *Root*, tapering, with one or more lateral roots attached in summer. *Stem*, simple, erect, and leafy; two, three, or more feet in height. *Leaves*, palmated and divided to the petiole into five wedged-shaped segments, each of which is deeply cleft into long and slender parts; smooth and shining, dark green above, paler underneath. *Inflorescence*, a long spike-like raceme of dark blue or deep violet-coloured flowers; the calyx consists of five petaloid sepals, the upper one of which is helmet-shaped, and the lateral ones are hairy on the inner side; the helmet is semicircular; the petals are five, of which the two upper are carried upon long stalks into the helmet, and there terminate in short horizontal sacks; the other petals are small and often abortive; the stamens are filiform, and the filaments are hairy; the ovaries are usually three, occasionally five.

Seeds numerous, angular, and wrinkled. *Flowering time*, May to July. *Habitat*, wooded hills in various countries of Europe; met with in this country, but not truly indigenous; cultivated as an ornamental plant in gardens.

*Characters.*—Aconiti Folia—*Aconite Leaves:* Leaves smooth, palmate, divided into five deeply-cut wedge-shaped segments; exciting slowly, when chewed, a sensation of tingling.[1] Flowers numerous, irregular, deep blue, in dense racemes.

Aconiti Radix—*Aconite Root—Fusiform:* From one to three inches long, not thicker than the finger at the crown, tapering, blackish-brown, internally whitish, with rootlets attached, or white scars showing where they had been attached. A minute portion, cautiously chewed, causes prolonged tingling and numbness.[2]

[1] This property they possess from the first, and it is retained until the seeds appear, but is entirely lost when these are ripe. [2] The root acquires its greatest medicinal and poisonous activity in winter and early spring, when it is leafless, and, consequently, when the means of recognising it are less than at any other season. Several fatal cases of accidental poisoning have occurred in consequence of aconite root having been used as a garnish by mistake for horse-radish. In the *Pharmaceutical Journal*, as referred to by the Pharmacopœia, Professor Bently thus contrasts the roots:—

| Monkshood. | Horse-Radish. |
|---|---|
| Conical in form, and tapering perceptibly to a point. | Slightly conical at the crown, then cylindrical, or nearly so, and almost of the same thickness for many inches. |
| Coffee-coloured, or more or less brownish externally. | White, or with a yellow tinge. |
| Odour merely earthy. | Odour especially developed upon scraping, when it is very pungent and irritating. |
| Taste at first bitter, but afterwards producing a disagreeable tingling and numbness. | Bitter or sweet, according to circumstances, and very pungent. |

EXTRACTUM ACONITI—Extract of Aconite.—*Take of the fresh leaves and flowering tops of aconite,* 112 *pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to* 130°, *and separate the green colouring matter by a calico filter. Heat the strained* *liquor to 200° to coagulate the albumen, and again filter. Evaporate the filtrate by a water-bath to the consistence of a thin syrup: then add to it the green colouring matter previously separated, and, stirring the whole together assiduously, continue the evaporation at a temperature not exceeding* 140°, *until the extract is of a suitable consistence for forming pills. Dose,* 1 *to* 2 *grs.*

TINCTURA ACONITI—TINCTURE OF ACONITE.—*Take of aconite root, in coarse powder,* 2½ *ounces; rectified spirit,* 1 *pint. Macerate the aconite root for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose,* 5 *to* 15 *mins.*

LINIMENTUM ACONITI—LINIMENT OF ACONITE.—*Take of aconite root, in coarse powder,* 20 *ounces; camphor,* 1 *ounce; rectified spirit, a sufficiency. Moisten the aconite with some of the spirit, and macerate in a closed vessel for three days; then transfer to a percolator, and adding more spirit, percolate slowly into a receiver containing the camphor, until the product measures one pint.*

**Aconitia**—ACONITIA.—An alkaloid, $C_{33}H_{43}NO_{12}$, obtained from aconite root, but met with in all parts of the plant in combination with aconitic acid. This is the active constituent, and an acrid volatile principle. In addition, other substances have been separated, which are, however, only of interest to the chemist.

*Characters and Tests.*—A white amorphous or crystalline solid, soluble in 150 parts of cold, and 50 of hot water, more soluble in alcohol and ether; alkaline and (FLUCKIGER) a strong solution of phosphoric acid gives a violet tint. It is very poisonous, $\frac{1}{30}$ gr. might prove fatal, and causes numbness and tingling when rubbed into the skin.

PREPARATION.—*Take of aconite root, in coarse powder,* 14 *pounds; rectified spirit, distilled water, solution of ammonia, pure ether, diluted sulphuric acid, of each, a sufficiency. Pour upon the aconite root three gallons of the spirit, mix them well, and heat until ebullition commences, then cool and macerate for four days. Transfer the whole to a displacement apparatus, and percolate, adding more spirit, when requisite, until the root is exhausted. Distil off the greater part of the spirit from the tincture, and evaporate the remainder over a water-bath until the whole of the alcohol has been dissipated. Mix the residual extract thoroughly* *with twice its weight of boiling distilled water, and when it has cooled to the temperature of the atmosphere, filter through paper. To the filtered liquid add solution of ammonia in slight excess, and heat them gently over a water-bath. Separate the precipitate on a filter, and dry it. Reduce this to coarse powder, and macerate it in successive portions of the pure ether with frequent agitation. Decant the several products, mix, and distil off the ether until the extract is dry. Dissolve the dry extract in warm distilled water acidulated with the sulphuric acid; and, when the solution is cold, precipitate it by the cautious addition of solution of ammonia, diluted with four times its bulk of distilled water. Wash the precipitate on a filter with a small quantity of cold distilled water, and dry it by slight pressure between folds of filtering paper.*

UNGUENTUM ACONITIÆ—OINTMENT OF ACONITIA.—*Take of aconitia,* 8 *grains; rectified spirits,* ½ *fluid drachm; prepared lard,* 1 *ounce. Dissolve the aconite in the spirit, add the lard, and mix thoroughly.*

*Therapeutics.*—Aconite is an energetic poison. All parts of the officinal plant are poisonous, owing to the presence of the alkaloid *aconitia*, which is the most deadly of its officinal preparations. This alkaloid is very much allied in its action to delphinia, veratria, and colchicina. The root is the most energetic part of the plant, and next in order, according to their activity, are the seeds, leaves, flowers, fruit, and stem. Even the smallest dose, such as cautiously chewing, without swallowing, a portion of one of the leaves or a slender shred of the root, or letting a drop or two of the tincture fall upon the tongue or lips, is followed by the physiological effects so characteristic of the plant, namely, a persistent numbness and burning taste, followed by a tingling of the parts touched, the sensation spreading to the throat. These effects are due to its being a local irritant and sedative, paralysing the sensory nerves. The following symptoms have been observed in cases of poisoning by aconite, all of which, however, are not necessarily present in every case, and their relative intensity will depend upon the manner in which the poison is taken, whether by one large dose, or by the repetition of smaller quantities. In a few minutes, or at latest within an hour, after taking the poison, there is a feeling of warmth in the stomach and nausea, which, according to circumstances, may proceed to severe irritation, accompanied by pain in the abdomen, and may be followed by vomiting and purging. The sensation of warmth beginning at the stomach is *gradually* distributed over the rest of the body, and is followed by numbness, a feeling of distension and tingling in the lips, tongue, cheeks, and throat, to relieve the parched condition of which the patient makes constant efforts at swallowing. The numbness and tingling gradually spread over the rest of the body, and are very distinct in the upper limbs and at the tips of the fingers. There is loss of muscular power, with giddiness and a sense of weariness and disinclination for exertion, usually culminating in utter prostration. The sensibility of the skin is greatly diminished. The heart's action is remarkably reduced, both in strength and frequency, the pulse being weak, and in some cases not exceeding forty beats per minute, until the last state arrives, when it usually rises into the small, weak, and frequent pulse of extreme debility. The respirations are also diminished in number and fulness, and are accomplished with more or less of effort. The pupil is at first contracted, but ultimately dilated, and there is dimness and confusion of sight. Towards the end, in a fatal case, the vertigo and depression of the vital powers are increased; the countenance is pale and anxious; the surface of the body is cold and clammy; the temperature is reduced (*vide* Bartholow, p. 411), to 92° Far., after ʒi of the tincture, and in Mr. Jones' case to 84° after 2 oz. of B. P. tincture (*Brit. Med. Jour.*, 3rd March, 1877); the pulse is rapid, irregular, and almost imperceptible; the breathing is performed by an irregular succession of sighs; there is frothing at the mouth, consciousness being commonly retained to the end. Occasionally the patient is completely paralysed; sometimes there is delirium, but the cerebral symptoms are rarely such as to deprive the patient entirely of consciousness; convulsions are seldom observed, though there are frequently tremblings or twitchings of the voluntary muscles; sight, hearing, and speech may be partially or quite lost. Death generally takes place between one and eight hours after taking the poison, and is due to gradual failure of the heart's action and respiratory movements, although sometimes it occurs suddenly from syncope, especially after some exertion on the part of the patient; and if life be sustained beyond the latter period, there is a probability of recovery, although the symptoms of depression will continue for several hours or longer. It is evident, therefore, that aconite paralyses the heart, and its contained ganglia; it paralyses also the muscles of respiration and the motor nerves, it is an irritant to mucous membranes; it increases the action of the skin and kidneys, and lowers the temperature. Aconite is, therefore, essentially a cardiac and motor depressant and paralyser of the sensory nerves. ***Medicinally***, aconite is used as an anodyne, sedative, antiphlogistic, and diuretic. It was first brought into notice by Störck of Vienna, and by him and his followers recommended in a very numerous class of diseases. Dr. Fleming of Birmingham also did much to raise the credit of aconite in this country.

It is employed, rubbed in locally, and at the same time administered internally, to relieve certain distressing local neuralgias, as tic-douloureux, pleurodynia, angina pectoris, &c. In such cases it is often of very great use. Its solutions in chloroform, or in a mixture of chloroform and alcohol, would appear, from the experiments of Dr. Augustus Waller, to be much more readily absorbed by the skin, and consequently much more active as a local application, than simple alcoholic solutions. Hence it is good to combine its liniment with that of chloroform for external use. Though it sometimes gives marvellously good results in neuralgia, yet, it must be confessed, that it more frequently fails. If, however, it is to succeed, it does so after two or three applications, and it seems to be more suitable for cases of pure neuralgia from exposure to cold, with more or less febrile disturbance, than when the pain is secondary to the inflammation set up by the irritation of a carious tooth, or by the pressure of a tumour, &c. It is also frequently useful as a *sedative* and *anodyne* application in lumbago, sciatica, in the painful joints of chronic gout and rheumatism, in cutaneous hyperæsthesia, in the treatment of sprains and contusions, &c. Care must be taken that aconite be not rubbed in where there is broken skin, lest poisonous symptoms result from its too rapid absorption. Internally, it is administered as a sedative and anodyne in certain painful affections of the heart, as in the pain resulting from constricted mitral, in angina pectoris, pericarditis, and nervous palpitations; to palliate the distressing agony resulting from internal aneurism; to calm the pain of cancer; to allay certain painful affections of the respiratory system, as in spasmodic asthma, emphysema, bronchitis, convulsive cough. It is often very beneficial in headache, when that coexists with a full bounding pulse and throbbing temples.

As an antiphlogistic, it is found useful in inflammatory diseases, such as cynanche tonsillaris, catarrhal croup, pleurisy, pneumonia, and in erysipelas. But it is only in the early stage of inflammation, while it is yet extending, that aconite does good.

Its diuretic properties are often beneficial in dropsies.

The administration of aconite in all cases requires careful watching to avoid inducing dangerous symptoms of depression.

*Antidote.*—There is no reliable chemical antidote; evacuate the stomach by stimulant emetics, keep patient in recumbent posture, give alcoholic stimulants, hot and concentrated, ammonia or strong coffee, and inject hypodermically tincture of digitalis, because it is a physiological antidote to the action of aconite on the heart (case of recovery after 1 oz. of Fleming's tincture had been taken, due to injection of digitalis.—*Brit. Med. Jour.*, 11th December, 1872).

**Podophyllum**—Podophyllum—Officinal plant: *Podophyllum peltatum*, Linn.; May Apple or American Mandrake, or Wild Lemon. Officinal parts—1. The root dried; imported from the United States. 2. *Podophylli Resina;* resin of podophyllum.

*Characters of the Root.*—In pieces of variable length, about two lines thick, wrinkled longitudinally, reddish brown externally, whitish within, breaking with a short fracture, with rootlets, or when broken off, their position is marked by scars on the under surface of the tuberosities. Powder, yellowish grey, sweetish in odour, bitterish, subacrid, and nauseous in taste. It is, however, rarely used, except to prepare the resin upon which the activity of the rhizome entirely depends.

**Podophylli Resina**—Resin of Podophyllum—Podophyllin.—A resin obtained from podophyllum by means of rectified spirit.

PREPARATION.—*Take of podophyllum root, in coarse powder,* 1 *pound; rectified spirit,* 3 *pints, or a sufficiency; distilled water, a sufficiency; hydrochloric acid, a sufficiency. Exhaust the podophyllum with the spirit by percolation; place the tincture in a still, and draw off the greater part of the spirit. Acidulate the water with one twenty-fourth of its bulk of hydrochloric acid, and slowly pour the liquid which remains after the distillation of the tincture into three times its volume of the acidulated water, constantly stirring. Allow the mixture to stand for twenty-four hours to deposit the resin. Wash the resin on a filter with distilled water, and dry it in a stove.*

*Characters.*—A pale greenish-brown amorphous powder, soluble in rectified spirit and in ammonia; precipitated from the former solution by water, from the latter by acids, and almost entirely soluble in pure ether. But it is not a definite active principle, it contains two resinous principles, a fixed and volatile oil, and a yellow alkaloid berberia. *Dose,* ⅙ to ½ gr.

*Therapeutics.* — Podophyllum, but more commonly its resin, is employed as a cholagogue, or drastic cathartic, according to the dose. It somewhat resembles jalap in its action as a cathartic, producing copious liquid evacuations, which are at first of a bilious character. Podophyllin often causes griping, and sometimes nausea, and must be tried cautiously until its mode of action in each case is ascertained;

for sometimes small doses act powerfully, whilst in other instances comparatively large doses have but little effect. While, then, there is no doubt as to its purgative action, there has been a great deal of discussion and difference of opinion as to its action on the liver, *i.e.*, its cholagogue power, which, however, we believe has been definitely settled in the affirmative by the experiments of Drs. Rutherford and Vignal. Thus they found—1st, That it does increase the secretion of bile ; 2nd, It acts more powerfully when it comes in contact with bile, which appears to be its proper solvent ; 3rd, Increase of the secretion is more marked when purgation is not severe ; indeed, if the purgative effect is very decided, diminution, and not increase of the biliary secretion is the result ; and 4th, The action is due to direct hepatic stimulation, and not simply to emptying of the gall bladder.

These experiments are confirmed by the result of clinical experience. It is most useful in constipation, accompanying, or dependent on affections of the liver. In torpid liver, hepatic congestion, not inflammatory, in biliousness, jaundice, independent of structural change (*i.e.*, catarrhal), in congestion of the portal circulation. It is apt, however, to cause pain and griping, and is somewhat uncertain in its operation. It is best, therefore, to commence with a small dose —$\frac{1}{6}$ gr.—and give it in combination with Ext. Belladonna or Hyoscyami. It may also advantageously be given with other purgatives, *e.g.*, Ext. Podophylli, gr. $\frac{1}{6}$ ; Ext. Belladonna, gr. $\frac{1}{4}$ ; Pil. Hydrargyri, gr. iii. Fiat pil.

**Magnoliaceæ, Illicium Anisatum**—Star Anise—So named from the stellate form of its fruit, and from its anise-like flavour. Officinal part : The oil distilled from the fruit in China. An evergreen shrub, about eight feet in height. Its fruit consists of from five to ten carpels, arranged in a stellate form, and, when ripe, brownish, hard, and woody. Each carpel contains one compressed, reddish-brown seed, from which the fragrant volatile oil is obtained by distillation. *Habitat*, China and Japan. A large proportion of the oil of aniseed (also known as *Oleum badianæ*) of commerce is supplied from this source, and is imported from China and Singapore. It is said to be superior to that obtained from *Pimpinella anisum*, from which it is distinguishable by being fluid at 35°.

**MENISPERMACEÆ**—Moon-Seed Order.—Trailing or climbing shrubs, inhabiting the tropical forests of Asia and America, where they climb among the trees to a considerable height. The plants possess narcotic and bitter properties ; some are poisonous, and a few mucilaginous. Officinal plants: *Cissampelos Pareira* and *Cocculus palmatus.*

**Pareira**—Pareira.—Officinal plant: *Cissampelos Pareira*, Linn.; —This plant, it has recently been shown, is not the true source of the Pareira root as stated in the B.P., as it is obtained from the Chondrodendron Tomentosum; *Pareira brava*, Wild Vine, or Velvet Leaf. Officinal part: The dried root from Brazil.

*Characters of the Root.*—Cylindrical, oval, or compressed pieces entire or split longitudinally, half-an-inch to four inches in diameter, and four inches to four feet in length. Bark greyish-brown, longitudinally wrinkled, crossed transversely by annular elevations; interior woody, yellowish-grey, porous, with well-marked, often incomplete, concentric rings and medullary rays. Taste at first sweetish and aromatic, afterwards intensely bitter.

*Active Constituents.*—*Cissampelin* or *Pelosin* ($C_{18}H_{21}NO_3$), an alkaloid, soluble in alcohol and ether, insoluble in water, identical with the alkaloid Beberia obtained from Nectandra Rodiæi. The dried root yields from four to five per cent. of it. The root also contains a yellow bitter principle, starch, nitrate of potash, &c.

DECOCTUM PAREIRÆ—DECOCTION OF PAREIRA.—*Take of pareira, sliced,* 1½ *ounce; distilled water,* 1 *pint. Boil for fifteen minutes in a covered vessel, then strain and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint. Dose,* 1 *to* 2 *fl. oz.*

EXTRACTUM PAREIRÆ—EXTRACT OF PAREIRA.—*Take of pareira root, in coarse powder,* 1 *pound; boiling distilled water,* 1 *gallon, or a sufficiency. Digest the pareira with a pint of the water for twenty-four hours, then pack in a percolator, and adding more of the water, allow the liquor slowly to pass until a gallon has been collected, or the pareira is exhausted. Evaporate the liquor by a water-bath until the extract has acquired a suitable consistence for forming pills. Dose,* 10 *to* 20 *grains.*

EXTRACTUM PAREIRÆ LIQUIDUM—LIQUID EXTRACT OF PAREIRA.—*Take of pareira, in coarse powder,* 1 *pound; boiling distilled water,* 1 *gallon, or a sufficiency; rectified spirit,* 3 *fluid ounces. Digest the pareira with a pint of the water for twenty-four hours, then pack in a percolator, and adding more of the water, allow the liquor slowly to pass, until a gallon has been collected or the pareira is exhausted. Evaporate the liquor by a water-bath to thirteen fluid* *ounces, and, when it is cold, add the spirit, and filter through paper. Dose,* fl.ʒi. *to* ʒii.

*Therapeutics.*—Pareira acts as a mild tonic, and somewhat as a diuretic in moderate doses, and in larger quantity as an aperient. It is believed to act upon the genito-urinary tract of mucous membrane, operating as a gentle astringent and sedative, and modifying the quality of the urine. It is given in chronic cystitis, and in all cases of chronic mucous and purulent discharges from the genito-urinary passages, as in catarrhal affections of the bladder, gonorrhœa, leucorrhœa, &c.; but it is chiefly valuable in correcting the mucous discharge of chronic cystitis, and for this purpose may be combined with anodynes, with alkalies, or with the mineral acids, as circumstances require. Any good results obtained from it in these cases are most probably due, not to the pareira, but to the other remedies which are usually given along with it. Formerly, it was held in repute as a lithontriptic, but its efficacy as such has not been established.

CALUMBÆ RADIX—CALUMBA ROOT.—The root, cut transversely and dried, of Jateorrhiza Calumba, *Miers*, and J. Miersii. From the forests of Eastern Africa, between Ibo and the Zambesi.

*Characters of the Root.*—Slices flat, circular, or oval, about two inches in diameter, and from two to four lines thick, softer and thinner towards the centre, greyish-yellow. The slices consist of an outer cortical portion, two or three lines in thickness, covered with a smooth or somewhat rugose, yellowish-grey or brownish epidermis; next to this is a very thin, dark-coloured layer; and internally is the ligneous portion, which is of a yellowish-grey colour, spongy, thinner towards the centre from shrinking in the drying, and marked with concentric rings and radiating lines. The taste is bitter, aromatic, and mucilaginous; the odour slightly aromatic. The blackening of the cold decoction by iodine is due to the presence of starch. The root is brittle, and therefore easily reduced to powder, which is slightly greenish, becomes darker by keeping, and readily decomposes by absorbing moisture. Sometimes the pieces are perforated; this is due to the removal of the starch by insects.

*Active Constituents.*—*Calumbin*, an inodorous, very bitter, crystallizable, neutral principle; *Berberina*, *calumbic acid*, a trace of volatile oil, &c., the root contains also about one-third of its weight of starch. It contains no tannin.

*Of the powder, dose,* five to twenty grains.

**EXTRACTUM CALUMBÆ**—Extract of Calumba.—*Take of calumba root, cut small, 1 pound; distilled water, 4 pints. Macerate the calumba with two pints of the water for twelve hours, strain and press. Macerate again with the same quantity of water, strain and press as before. Mix and filter the liquors, and evaporate them by the heat of a water-bath until the extract is of a suitable consistence for forming pills. Dose, 2 to 10 grains.*

**INFUSUM CALUMBÆ**—Infusion of Calumba.—*Take of calumba root, cut small, ½ ounce; cold distilled water, 10 fluid ounces. Dose, ℥i. to ℥ii.*

**TINCTURA CALUMBÆ**—Tincture of Calumba.—*Take of calumba root, cut small, 2½ ounces; proof spirit, 1 pint. Macerate the calumba for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose, fl.ʒi. to ʒii.*

*Therapeutics.*—Calumba acts as a mild bitter tonic and stomachic, neither stimulant nor astringent, but somewhat demulcent from the starch and mucilage which it contains. It allays irritability of the stomach, improves the appetite, and is frequently retained when other tonics would be rejected. It is given in cases of general debility, with feeble appetite, imperfect digestion, acidity, and flatulence; in convalescence from exhausting diseases; to arrest the vomiting of pregnancy, of a bilious attack, that which arises from renal calculi, or which obstinately persists after the administration of an emetic, and in other forms of vomiting of a non-inflammatory origin. It is given also as a mild tonic in certain cases of diarrhœa, dysentery, low fever, &c.

**PAPAVERACEÆ**—The Poppy Order.—Herbs with a milky or coloured juice, chiefly inhabitants of Europe. The medicinal properties of this order are principally narcotic; some of the plants yield an acrid juice, and some are purgative. Officinal plants: *Papaver Rhœas, Papaver somniferum.*

**Rhœados Petala**—Red Poppy Petals.—Officinal plant: *Papaver Rhœas*, Linn.; Corn Poppy, Red Poppy. Officinal part: The fresh petals; from indigenous plants.

*Characters of the Petals.*—Of a scarlet colour and heavy poppy odour.

*Therapeutics.*—They contain 40 per cent. of red colouring matter, composed of two acids, Rhœadic and Papaveric. Formerly they were also believed to contain morphia (CHEVALIER), but disproved by Attfield, 1873. Hence the petals have no medicinal action, and are only used as a colouring ingredient in the form of *Syrupus Rhœados.*

SYRUPUS RHŒADOS—SYRUP OF RED POPPY.—*Take of fresh red poppy petals,* 13 *ounces; refined sugar,* 2¼ *pounds; distilled water,* 1 *pint, or a sufficiency; rectified spirit,* 2½ *fluid ounces. Add the petals gradually to the water heated in a water-bath, frequently stirring, and afterwards, the vessel being removed, infuse for twelve hours. Then press out the liquor, strain, add the sugar, and dissolve by means of heat. When nearly cold, add the spirit, and as much distilled water as may be necessary to make up for loss in the process, so that the product shall weigh three pounds ten ounces. It should have the specific gravity* 1·330.

*Dose.*—Fl.ʒi. and upwards.

**Papaveris Capsulæ**—Poppy Capsules—Officinal Plant: *Papaver somniferum,* Linn.; White Poppy, Opium Poppy, Garden Poppy. Officinal part: The nearly ripe capsules, dried and deprived of the seeds; cultivated in Britain.

*Botany.*—Annual. *Root,* white and tapering. *Stem,* two to four feet high, erect, round, smooth, glaucous, branching, with a few rigid spreading hairs at the upper part. *Leaves,* amplexicaul, alternate, large, oblong, waved at the margins, lobed, glaucous. *Flowers,* large, terminal, with four large petals of a bluish-white colour, having a broad purple or violet spot at the base. *Capsule,* large, smooth, oval, or nearly globose, with parietal placentæ equal to the number of stigmas. *Seeds,* numerous, covering the placentæ, reniform, white or brownish, oily, not narcotic. *Flowering time,* June and July, the capsules ripening about two months afterwards. *Habitat,* probably Persia; but common in gardens, fields, and waste places throughout Europe, apparently wild, but probably having escaped from gardens; cultivated in Asia Minor, India, and Egypt for the preparation of opium; that which is cultivated in Britain being valuable only for the capsule and the oil obtained from the seeds.

*Characters of the Poppy Capsules.*—Globular, two or three inches in diameter, crowned by a sessile stellate stigma. Their analysis gives different results, with regard to morphia, Merck and Winkler obtained 2 per cent.; but others have failed to obtain it. This discrepancy is no doubt owing in a great measure to the period when collected, as

Meurein and Aubergier have proved that they contain most morphia before they are ripe, when they ought to be collected. Some of the other principles of opium have also been found to some extent, as codeia, narcotine, and rhœadine.

*Therapeutics.—Action*, anodyne, sedative, and narcotic, but varying in strength, and therefore in action. Used instead of opium, as it is less powerful, and the after effects are believed to be less disagreeable. Its action, however, is similar, and it has the disadvantage of being uncertain, and the dose is larger.

EXTRACTUM PAPAVERIS—Extract of Poppies.—*Take of poppy capsules, dried, freed from the seeds and coarsely powdered,* 1 *pound; rectified spirit,* 2 *ounces; boiling distilled water, a sufficiency. Mix the poppy capsules with two pints of the water, and infuse for twenty-four hours, stirring them frequently; then pack them in a percolator, and adding more of the water, allow the liquor slowly to pass until about a gallon has been collected, or the poppies are exhausted. Evaporate the liquor by a water-bath until it is reduced to a pint, and, when cold, add the spirit. Let the mixture stand for twenty-four hours, then separate the clear liquor by filtration, and evaporate this by a water-bath until the extract has acquired a suitable consistence for forming pills. Dose,* 2 *to* 5 *grs. in pill.*

DECOCTUM PAPAVERIS—Decoction of Poppies.—*Take of poppy capsules, bruised,* 2 *ounces; distilled water,* 1½ *pint. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.*

*Therapeutics.*—This decoction is employed only externally, as a soothing application. It possesses whatever anodyne ingredients the capsules may contain, and when the seeds are not rejected it is emollient. It is employed as a fomentation to bruised and inflamed surfaces ; to the eye in ophthalmia, to painful tumours, as an injection in painful affections of the vagina or uterus, &c.

SYRUPUS PAPAVERIS—Syrup of Poppies.—*Take of poppy capsules, dried, freed from the seeds and coarsely powdered,* 36 *ounces; rectified spirit,* 16 *fluid ounces; refined sugar,* 4 *pounds; boiling distilled water, a sufficiency. Mix the poppy capsules with four pints of the water, and infuse for twenty-four hours, stirring them frequently; then pack them in a percolator, and adding more of the water, allow the liquor slowly to pass until about two gallons have been collected, or the* *poppies are exhausted. Evaporate the liquor by a water-bath until it is reduced to three pints. When quite cold add the spirit, let the mixture stand for twelve hours, and filter. Distil off the spirit, evaporate the remaining liquor to two pints, and then add the sugar. The product should weigh six pounds and a-half, and should have the specific gravity* 1·320.

*Therapeutics.*—This syrup possesses the properties of opium to such an extent as the capsules are capable of yielding them; but it is at best an uncertain preparation. The dose will vary with the strength of the preparation and circumstances of the patient, from half a fluid drachm to three or four fluid drachms. A spurious syrup is not unfrequently made by adding tincture of opium to simple syrup.

**Opium** — Opium — (*ὀπός, the juice*). — *The juice inspissated by spontaneous evaporation, obtained by incision from the unripe capsules of the poppy—Papaver somniferum—grown in Asia Minor.*

The method of obtaining opium from poppy capsules, though differing in some of its details, is nearly alike in all the opium-producing countries, and is briefly as follows:—A few days after the fall, or the gathering of the petals, when the capsules are still unripe, but full of a thick milky juice, the opium collectors incise each capsule by means of a sharp instrument, usually consisting of four or five parallel blades. These incisions are made in the evening, great care being taken to prevent the blades penetrating into the interior of the capsule, whereby not only a loss of opium would accrue, but, moreover, the seeds contained within the capsule, from which a bland fixed oil is afterwards obtained, would be rendered valueless. The capsules are scarified rather than incised. During the night the milky juice exudes through the incisions, and on the following morning the collectors pass from plant to plant, scraping the tears of opium from the capsules, and carefully depositing them either upon leaves or in vessels for further manipulation. In Asia Minor where the officinal opium is collected, the tears are carefully collected and placed on a poppy leaf, and when a sufficient quantity has been got to form a cake or lump, it is wrapped in poppy leaves and placed for a short time to dry in the shade.

*Varieties.*—Several have been described—viz., Turkey (Smyrna and Constantinople), Egyptian, East Indian, Persian, and European. But only the first, collected in Asia Minor, is officinal, and should therefore be exclusively employed in making the officinal preparations, as it is, as a rule, the best—*i.e.*, the richest in active constituents.

*Turkey Opium* (Syria, Asia Minor, Anatolia, and Levant opium) includes Smyrna and Constantinople opium, according to the port from which it has been shipped; that from Smyrna being the most commonly imported into the country.

*Characters.*—Irregular lumps, weighing from four ounces to two pounds; enveloped in the remains of poppy leaves, and generally covered with the chaffy fruits of a species of rumex; when fresh, plastic, tearing with an irregular slightly moist chestnut-brown surface, shining when rubbed smooth with the finger, having a peculiar odour and nauseous bitter taste.

*Constantinople Opium* may equal Smyrna Opium in value, but is generally regarded as somewhat inferior to it. It is met with in two forms—the one in large irregular cakes, more or less resembling the Smyrna variety, the other in smaller flattened cakes of regular lenticular form, between two and three inches in diameter, and covered with a poppy leaf, the midrib of which is seen crossing the middle of each piece.

At least from six to eight per cent. of morphia ought to be obtained from a medicinal sample of opium; but from numerous analyses which have been recently made this appears to be too low an estimate, the percentage varying from 10 to 17, and good Smyrna opium, deprived of water, ought to yield 12 to 15 per cent. of morphia; if less than 10 per cent., adulteration may be suspected. The medicinal value of opium can only be determined by chemical analyses to ascertain the amount of morphia which it contains, and for determining this the Pharmacopœia gives the following:—

PURITY TEST.—*Take of opium, 100 grains; slaked lime, 100 grains; distilled water, 4 ounces. Break down the opium, and steep it in an ounce of the water for twenty-four hours, stirring the mixture frequently. Transfer it to a displacement apparatus, and pour on the remainder of the water in successive portions, so as to exhaust the opium by percolation. To the infusion thus obtained, placed in a flask, add the lime, boil for ten minutes, place the undissolved matter on a filter, and wash it in an ounce of boiling water. Acidulate the filtered fluid slightly with diluted hydrochloric acid, evaporate it to the bulk of half-an-ounce, and let it cool. Neutralise cautiously with solution of ammonia, carefully avoiding an excess; remove by filtration the brown matter which separates, wash it with an ounce of hot water, mix the washings with the filtrate, concentrate the whole to the bulk of half-an-ounce, and add now solution of ammonia in slight excess. After twenty-four hours collect the precipitated morphia on a weighed filter, wash it with cold* *water, and dry it at 212°. It ought to weigh at least from six to eight grains.*

*Composition of Opium.*—Opium is an exceedingly complex substance, and is still yielding new constituents to scientific investigation. Some of its ingredients are given up to water, and still more to alcohol and ether; others are separated by chemical processes, and these again form the bases of a series of pharmaceutical preparations.

| | |
|---|---|
| Water, . . . . . . . . . . . | 30 per cent. |
| Resin, mucilage, albumen, bits of poppy capsules, | =60 per cent. |
| Wax, sugar, colouring matter, volatile bodies and calcareous salts, . . . . . . | =6–10 per cent. |

Active ingredients, these consist of acids, alkaloids, and neutral bodies.

We shall first consider the simple galenical preparations of the drug, and their actions and uses, and afterwards the chief of its active constituents separately.

CONFECTIO OPII—Confection of Opium.—*Take of compound powder of opium,* 192 *grains; syrup,* 1 *fluid ounce. Mix.*

EMPLASTRUM OPII—Opium Plaster.—*Take of opium, in fine powder,* 1 *ounce; resin plaster,* 9 *ounces. Melt the resin plaster by means of a water-bath; then add the opium by degrees, and mix thoroughly.*

ENEMA OPII—Enema of Opium.—*Take of tincture of opium,* ½ *fluid drachm; mucilage of starch,* 2 *fluid ounces. Mix.*

EXTRACTUM OPII—Extract of Opium.—*Take of opium, in thin slices,* 1 *pound; distilled water,* 6 *pints. Macerate the opium in two pints of the water for twenty-four hours, and express the liquor. Reduce the residue of the opium to a uniform pulp, macerate it again in two pints of the water for twenty-four hours, and express. Repeat the operation a third time. Mix the liquors, strain through flannel, and evaporate by a water-bath until the extract has acquired a suitable consistence for forming pills.*

EXTRACTUM OPII LIQUIDUM—Liquid Extract of Opium. —*Take of extract of opium,* 1 *ounce; distilled water,* 16 *fluid ounces; rectified spirit,* 4 *fluid ounces. Macerate the extract of opium in the water for an hour, stirring frequently, then add the spirit, filter, and the product should measure one pint. It contains* 22 *grains of extract of opium, nearly, in one fluid ounce.*

LINIMENTUM OPII—LINIMENT OF OPIUM.—*Take of tincture of opium, liniment of soap, of each, 2 fluid ounces. Mix.*

PILULA SAPONIS COMPOSITA—Pilula Opii—Opium Pill. Lond. Dub.—*Take of opium, in powder, ½ ounce; hard soap, in powder, 2 ounces; distilled water, a sufficiency. Mix the opium and soap, and beat into a mass with the water.*

PULVIS CRETÆ AROMATICUS CUM OPIO—AROMATIC POWDER OF CHALK AND OPIUM.—*Take of aromatic powder of chalk, 9¾ ounces; opium, in powder, ¼ ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle.*

PULVIS OPII COMPOSITUS—COMPOUND POWDER OF OPIUM. —*Take of opium, in powder, 1½ ounce; black pepper, in powder, 2 ounces; ginger, in powder, 5 ounces; caraway fruit, in powder, 6 ounces; tragacanth, in powder, ½ ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Keep it in a stoppered bottle.*

TINCTURA OPII—TINCTURE OF OPIUM (Laudanum).—*Take of opium, in coarse powder, 1½ ounce; proof spirit, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation, then strain, press, filter, and add sufficient proof spirit to make one pint.*

TINCTURA OPII AMMONIATA—AMMONIATED TINCTURE OF OPIUM—Scotch Paregoric Elixir.—*Take of opium, in coarse powder, 100 grains; saffron, cut small, benzoic acid, of each, 180 grains; oil of anise, 1 fluid drachm; strong solution of ammonia, 4 fluid ounces; rectified spirit, 16 fluid ounces. Macerate for seven days in a well-closed vessel, with occasional agitation, then strain, press, filter, and add sufficient rectified spirit to make one pint.*

TROCHISCI OPII—OPIUM LOZENGES.—*Take of extract of opium, 72 grains; tincture of tolu, ½ fluid ounce; refined sugar, in powder, 16 ounces; gum acacia, in powder, 2 ounces; extract of liquorice, 6 ounces; distilled water, a sufficiency. Add the extract of opium, first softened by means of a little water, and the tincture of tolu to the extract of liquorice, heated in a water-bath. When the mixture is reduced to a proper consistence, remove it to a slab, add the sugar and gum, previously rubbed together, and mix thoroughly. Divide the mass into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains one-tenth of a grain of extract of opium.*

VINUM OPII—WINE OF OPIUM.—*Take of extract of opium,* 1 *ounce; Cinnamon bark bruised, cloves bruised, of each 75 grains; sherry, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation, and filter.*

Opium is likewise a principal ingredient in the following officinal preparations, the formulæ for which are given elsewhere:—*Pilula Ipecacuanhæ cum Scilla, Pilula Plumbi cum Opio, Pulvis Ipecacuanhæ Compositus, Pulvis Kino, Tinctura Camphoræ Composita, Unguentum Gallæ cum Opio.*

*Dose.*—The following is a list of all the officinal preparations. The dose, of course, will vary according to the age and habits of the patient, the nature of the disease, and the object of its administration, The doses here given are for adults.

*a. Officinal*—

1. *Solid Opium* may be given in the crude or powdered form, in doses extending from one-sixth of a grain up to four or five grains, but the latter only in extraordinary cases.
2. *Confectio Opii* corresponds pretty closely with the confection of opium *L.* Its actions and uses are the same as those of the compound powder of opium given below, only it presents the choice of a different form of administration. *Dose*, five to twenty grains.
3. *Emplastrum Opii* is used as a strengthening and anodyne application in lumbago, rheumatic, neuralgic, and other painful affections.
4. *Enema Opii* is administered in painful affections of the parts in the vicinity of the rectum, and when the drug cannot conveniently be given in the ordinary way. It is doubtful whether more opium can safely be given by the rectum than by the stomach: opinions differ, some physicians believing that more, others that less should be given by the rectum. The most common practice is to administer one-half more by the bowels than by the mouth. The officinal enema contains half a fluid drachm of the tincture.
5. *Extractum Opii* is an aqueous preparation. It contains the active ingredients of opium without the inert principles and impurities of the crude drug, and therefore should be relatively stronger; but, practically, the dose is the same as the crude opium. It has the advantage of being soluble in water, and is said to give rise to less constitutional disturb-

ance than some of the other preparations. Good opium should yield from 50 to 70 per cent. of this extract.

6. *Extractum Opii Liquidum* is the officinal representative of *Battley's Sedative Solution.* It is about one-seventh stronger than the tincture, and should be given in somewhat smaller doses ; but Mr. Squire states that the quantity of spirit in the officinal preparation is insufficient to preserve it, and suggests that it should be doubled, whereby the liquid extract would be reduced to the strength of the tincture and the wine. *Dose* of the officinal preparation, ten to forty minims.

7. *Linimentum Opii*—a local anodyne application to sprains, rheumatic and neuralgic pains.

8. *Pilula Saponis Composita.*—Strength, one grain of opium in five of the pill mass. *Dose*, two or three to ten grains, and may be used as a suppository.

9. *Pulvis Cretæ Aromaticus cum Opio.*—Strength, one grain of opium in forty of the powder. *Dose*, ten to forty grains in diarrhœa.

10. *Pulvis Opii Compositus* is aromatic and narcotic, useful as an adjunct to chalk mixture and other astringent substances in the cure of diarrhœa. It is also used in flatulent colic. It represents very nearly the dry ingredients of the Confectio Opii, *L.* It is employed in the preparation of *Confectio Opii,* of which it forms one part in four, nearly. *Dose*, two to five grains.

11. *Tinctura Opii.*—The spirituous solution of opium contains all the active ingredients of opium, and acts more promptly than the solid preparations. Strength, one grain of opium in fourteen and one-third minims. *Dose*, ten to forty minims.

12. *Trochisci Opii.*—Each lozenge contains one-tenth of a grain of extract of opium. *Dose*, one to six lozenges occasionally.

13. *Vinum Opii.*—Strength (1 in 14¼) and dose (10 to 40 minims), same as the tincture. It is used in ophthalmia, either dropped into the eye or added to collyria.

14. *Pilula Ipecacuanhæ cum Scilla.*—Strength, about three-tenths of a grain of opium in five. (See under Ipecacuanha.)

15. *Pilula Plumbi cum Opio.*—Strength, one grain of opium to

eight grains of the pill mass. *Dose*, one four-grain pill, or more. (See under Lead.)

16. *Pulvis Ipecacuanhæ Compositus.*—Ten grains of the powder contain one of ipecacuan, one of opium, and eight of sulphate of potash. *Dose*, five to fifteen grains. (See under Ipecacuanha.)

17. *Pulvis Kino Compositus.*—Strength, one grain of opium in twenty. *Dose*, five, ten, or more grains. (See under Kino.)

18. *Tinctura Camphoræ Composita.*—Strength, two grains of opium in one fluid ounce. *Dose*, thirty minims to three fluid drachms. (See under Camphor.)

19. *Tinctura Opii Ammoniata—Scotch Paregoric.*—An ounce contains five grains of opium, so that it is 2½ times as strong as the camphorated tincture, which is commonly known by the name of *English Paregoric*. *Dose*, one-half to one fluid drachm.

20. *Unguentum Gallæ cum Opio.*—Strength, one grain of opium in fourteen and two-thirds. (See under Galls.)

21. *Morphiæ Acetas.*—*Dose*, one-eighth to one-half of a grain; the hydrochlorate is preferable.

22. *Liquor Morphiæ Acetatis.*—Strength, same as the solution of the hydrochlorate. *Dose*, ten to forty minims.

23. *Morphiæ Hydrochloras.*—*Dose*, one-eighth to one-half of a grain; endermically, from one to two grains.

24. *Liquor Morphiæ Hydrochloratis.*—Strength, four grains to the fluid ounce, or half-a-grain to the fluid drachm. *Dose*, ten to forty minims.

25. *Injectio Morphiæ Hypodermica.*—A solution of acetate of morphia, containing one grain of the acetate in twelve minims of the injection. *Dose, by subcutaneous injection*, one minim to six minims.

26. *Trochisci Morphiæ.* — Strength, each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia. *Dose*, one to six lozenges occasionally.

27. *Trochisci Morphiæ et Ipecacuanhæ.*—Strength, each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia, and one-twelfth of a grain of ipecacuanha. *Dose*, one to six lozenges occasionally.

28. *Suppositoria Morphiæ.*—Each suppository contains half-a-grain of hydrochlorate of morphia.
29. *Suppositoria Morphiæ cum Sapone.*—Each suppository contains half-a-grain of the hydrochlorate of morphia, and about eight and a-half grains of curd soap.

*b. Non-officinal*—

1. *Morphia.*—*Dose*, one-quarter to one-half of a grain; not used in consequence of its insolubility.
2. *Syrupus Morphiæ Acetatis* (D.P.)—*Dose*, one fluid drachm, or more.
3. *Syrupus Morphiæ Hydrochloratis* (D.P.)—*Dose*, one fluid drachm, or more.
4. *Morphiæ Sulphas* (U.S.P.)—*Dose*, one-eighth to one-quarter of a grain.
5. *Liquor Morphiæ Sulphatis* (U.S.P.)—Strength, one grain to the ounce. *Dose*, one fluid drachm, or more.
6. *Syrupus Morphiæ Sulphatis* (Paris Codex).—Strength, one-quarter of a grain of the sulphate in each ounce. *Dose*, two fluid drachms, or more.
7. *Solutio Morphiæ Bimeconatis* (Squire).—Strength and dose, same as tincture of opium. Said to interfere less with the head, stomach, and bowels than other preparations of morphia, but this is exceedingly doubtful. It is the common form in which morphia is injected subcutaneously. But it is then usually made double strength, and from ten to twenty minims are sufficient for one injection.
8. *Liquor Opii Sedativus* (Battley).—Strength, about 40 per cent. above that of tincture of opium. *Dose*, five to twenty minims. Used as an anodyne and sedative, superior to the tincture.
9. *Black Drop.*—Strength, one drop equal to four of the tincture of opium. *Dose*, four to ten minims.
10. *Nepenthe* (Ferris).—*Dose*, same as tincture of opium.
11. *Pilula Calomelanos et Opii* (E.P.)—Each pill contained two grains of calomel and two-thirds of a grain of opium. *Dose*, one or two pills.
12. *Electuarium Opii* (E.P.)—Strength, one grain of opium in forty-three. *Dose*, ten to sixty grains.
13. *Acetum Opii* (E. & D.P.)—Strength of the Edinburgh prepar-

ation, four ounces of opium to sixteen fluid ounces of distilled vinegar; the Dublin preparation was about equal to the tincture. *Dose* of the former, five to twenty minims; of the latter, ten to forty minims.

14. *Pilula Opii sive Thebiacæ* (E.P.)—Strength, one grain of opium in five.
15. *Pilula Styracis Composita* (L.P.)—*Pilula Styracis* (E.P.)—Strength, one grain of opium in five.
16. *Unguentum Opii* (L.P.)—Strength, twenty grains of powdered opium to the ounce of lard.

*Therapeutics.*—Opium, in over-doses, acts as a powerful narcotic poison, varying in the rapidity, manner, and intensity of its effects according to the susceptibility of the patient and the quantity and form of the drug employed. We shall briefly consider the effects of opium under the following heads:—1. Sudden or acute poisoning, or poisoning by one excessive dose. 2. Chronic or slow poisoning, opium eating and smoking. 3. Medicinal effects. 4. Peculiarities.

1. The following are the symptoms which are usually observed after an excessive dose of opium, in the case of a person not accustomed to the drug. The excitement which follows and continues for some time after a smaller dose is of short duration, and sometimes not perceptible; the patient soon becomes giddy and stupid; he is very drowsy, and craves the indulgence of sleep; when left alone, he lies motionless, and in a state of sopor, from which he can still be roused by loud appeals or shaking. But these impressions immediately pass off, and he falls again into a state of stupor, which gradually deepens, until, at length, he becomes utterly insensible and comatose; nevertheless, treatment is by no means to be abandoned, for by the assiduous application of galvanism and artificial respiration remarkable recoveries have occurred. During this time the *pulse* is at first small and quick, afterwards slow and full, and at last feeble, flickering, or imperceptible; the *breathing* is at first hurried, then slow and stertorous; the *countenance* is at first placid and pale, then ghastly; the *eyelids* are closed; the *pupils* are almost always closely contracted; the *skin* is at first warm and moist, then cold and clammy; the *voluntary muscles* are relaxed and powerless; vomiting and purging sometimes occur, and occasionally convulsions precede death. The breath may have the peculiar odour of opium. The symptoms of poisoning generally make their appearance within an hour of the time at which the drug was taken, sometimes within a few minutes, but occasionally not until two or more hours have elapsed; if the stomach contains food, if the opium

be taken in the solid form, or, it is also said, if the person be intoxicated at the time, the symptoms will supervene slowly, and *vice versâ.* Fatal cases usually terminate in from six to twelve hours after the poison has been taken; but there are some cases in which death takes place very rapidly, and others in which the patient partially recovers, so far as to be able to converse rationally with those around him, then suffers a relapse, and dies after some days. When the patient survives twelve hours, and is restored to consciousness, there is a good prospect of his complete recovery; he then falls into a sound sleep, which may continue from twenty-four to thirty-six hours, from which he awakes to suffer the distressing after-effects, such as headache, vertigo, nausea, vomiting, loss of appetite, and general debility. It is difficult to state accurately the poisonous dose of opium or any of its compounds, as so much depends on the susceptibility of the individual, the purity of the drug, and the relative strength of the preparations; but it must be borne in mind that, whilst comparatively small doses produce but little effect in some people, and in certain diseases, and whilst some persons have recovered after taking enormous doses, on the other hand, there are cases on record in which far less than the ordinary medicinal dose has given rise to alarming symptoms. Infants and children are very susceptible of the influence of opium. A single drop of laudanum has proved fatal, and complete narcotism is very commonly the result of two or three drops of laudanum, or an equivalent of Godfrey's cordial, or other opiate nostrum, when given to infants.

2. A good deal has been written in the attempt to prove that the practice of opium-eating and of opium-smoking is not so detestable as other writers would make it appear; but the utmost that can be said in its favour is, that it is not a greater vice than many others, especially spirit-drinking. In this country, the practice of opium-eating, in one form or other, is carried to a deplorable extent; and it is but small consolation to say that it is less injurious to the health and less brutalising than dram-drinking. Both tend ultimately to destroy life; for although there are many exceptional cases of both drunkards and opium-eaters attaining the full term of years, still the rule in both is a rapid and a short career. If alcohol is more rapid in its injurious effects, opium is more sure: a man may keep alcohol in its proper place as an article of diet and as a medicine, but it is almost impossible in this climate for any person to retreat from the miserable cravings of an opium-eater. Opium-eating usually begins in the taking of medicinal doses of the drug, for the purpose of relieving a cough, allaying a pain, or checking a diarrhœa; or it is

substituted by the drunkard for his quondam dram, as being a newer and more attractive stimulant; or it is resorted to by those who move in the higher circles of society, as being less easy of detection than alcoholic stimulants; or it is appealed to by the brain-worn man of letters to revive his drooping energies, or by the poet and the painter to intensify their imaginative powers. For these purposes, the object of the opium-eater is to produce and prolong the first stage of poisoning. At first small doses, as half-a-grain to one or two grains, will produce the desired effect; but ultimately one, two, or even three or more drachms of the crude drug will scarcely suffice to sustain its victim for a day. Under the exciting influence of opium, work, of whatever kind, is executed with the least effort; that which without such adventitious stimulus would be produced only by intense application, under the influence of opium flows almost spontaneously. But as a rule in those who do not habitually take opium, true mental power is during all stages of its action diminished rather than increased. Even in those accustomed to its use as an aid to work, it is the imagination rather than the reasoning faculties which are excited by it. And even as an aid to genuine work, or for whatever purpose the habit may be engendered, it behoves the dabbler in opium-eating seriously to count the cost before he commits himself to a practice which he would probably never relinquish. Either by a timely resolution, therefore, supported by medical treatment, if necessary, he must at once resist the craving, and flee from his adversary; or, as a confirmed opium-eater, he must deliver himself a prey to the constant and increasing demands of his inexorable taskmaster, and so induce a state of mind and body which no achievements, however brilliant, can mitigate, and which no reputation, however lasting, could compensate. And, moreover, the opium-eater cannot long hide his weakness from the world; sooner or later he is betrayed by his withered frame, his sallow countenance, and his preternaturally bright and deep-set eyes, by his bent back, his tottering gait, and his premature old age. His opium supplants his food, his appetite and digestive powers being impaired; his physical strength diminishes, and his spirits droop. When seen in the morning, before he has had his dose, he presents all the feebleness and decay, without the venerable appearance, of old age; but soon after he has swallowed his potion he freshens up wonderfully, puts on an air of active vigour, and follows his accustomed pursuits as before. This state, however, is only purchased by increasing supplies of the drug; but even the largest doses at length fail; his intellect follows the wreck of his body; and finally, either through shame or abject misery, the wretched victim of this degrading habit either falls by his own hand or dies in hopeless impotency. There are cases, however, in which the prolonged use of opium, even in very large doses, is necessary to carry patients through the sufferings which attend their diseases; and many instances are recorded of persons having recovered under such circumstances, who neither subsequently continued the use of the drug, nor felt any evil effects from the large quantity previously taken. And there are other cases in which the use of opium is continued until death, to mitigate the sufferings arising from chronic disease, without producing the demoralising effects above referred to. But such cases as these differ completely from those in which opium is employed as a source of sensual gratification.

3. As a medicine, opium has been classed with narcotics, hypnotics, anodynes, stimulants, sedatives, calmatives, diaphoretics, anti-spasmodics, anti-dysenterics, anti-hysterics, febrifuges, &c. The nature and relative extent of the several effects produced by the drug will depend chiefly upon the dose, temperament, idiosyncrasy, habit, and condition of the patient, the time of day or night at which it is taken, and the circumstances surrounding the patient. Small doses, not exceeding one grain, generally act, in persons not accustomed to the drug, as stimulants, quickening the circulation, and inducing that clear, lively, and imaginative state of mind already referred to; the face is usually flushed at this stage, the eyes preternaturally bright, and there is at first a sensation of fulness in the head. This, the first or excitement stage of opium-poisoning, is longer continued in proportion to the smallness of the dose employed to produce it, and it is this stage that the opium-eater and smoker endeavours to prolong; but whilst in him the tendency to sleep has by habitual resistance been overcome, in the case of the unaccustomed patient the soporific influence of the opium soon follows, and after a sleep, less refreshing than "Nature's sweet restorer," he awakes in a state of general discomfort. When it is necessary, as for the relief of pain, or other cause, to repeat such doses, they gradually lose their power, and must be proportionately increased to produce the desired results. The action of opium upon the cerebro-spinal system is observed in the excitement and subsequent depression and sopor of moderate doses, and in the diminished sensibility, contracted pupil, loss of muscular power, and final coma of poisonous quantities; its action upon the vascular system is observed in the variable effects produced upon the pulse, the turgidity of the countenance, and the sensation of fulness in the head; its action upon the respiratory system is observed in

the early hurried and later slow and stertorous breathing; its action upon the alimentary canal is observed in the dryness of the mouth and throat, increased thirst, diminished appetite, and constipation; in the sallow, bilious appearance of the countenance; in the impaired powers of digestion; and in the diminished sensibility of the stomach to the influence of emetics, but sometimes also in the production of nausea and vomiting; and it is to be remembered that some of these effects, especially constipation, are not constant to the opium-eater, as it is very common to find diarrhœa of thin serous stools accompanying the habit. Its action upon the urinary organs is observed in the commonly diminished quantity of urine, whether caused by a less secretion by the kidneys, or by retention in the bladder, and in the relief from pain produced by calculi; its action upon the organs of generation is observed in the manifestation of the aphrodisiac properties of the drug when employed in moderation, and in the impotency which follows its abuse, both of these results, however, being probably due to the general condition of the system, rather than to any specific action upon these organs. It does not materially interfere with the functions of the uterus, nor check the secretion of milk, although it renders it narcotic. Its action upon the skin is observed in the diminished sensibility which it produces, in the increase of perspiration (the only secretion which is unequivocally increased by it), in the itchiness which is felt by some persons, and in the eruption which occasionally follows its use.

When applied externally, opium acts either topically, but its action in this respect is slight, and is thus frequently used in allaying superficial pain, or generally, by its absorption into the system. It is not likely to act upon the system, however, when merely applied to the cuticle, nor even when rubbed upon it. But when applied endermically or hypodermically, opium and its active constituents act, if not more so, at least as rapidly and powerfully as when given by the stomach.

Opium and its preparations are used for so many purposes, in so many diseases, and in combination with so many drugs, that it is quite beyond the scope of the *Note-Book* even to mention all of them. *In continued fever*, opium is frequently of great benefit in subduing nervous excitement, delirium, tremor, restlessness, and insomnia. Its administration, however, under these circumstances, demands the greatest caution and nicest discrimination to prevent dangerous results. The symptoms indicating its employment are sleeplessness, restlessness, low muttering delirium, tremor, muscular twitchings, and diarrhœa. It is contra-indicated in tendency to coma and contracted pupils. *In inflammation*, it is largely employed to allay pain, restlessness, check secretions, to operate as an antiphlogistic, alone or in combination with calomel, tartar emetic, or other drug, to act as an antispasmodic, and to check hyper-secretion. *In diseases of the nervous system*, it is employed to allay pain, as in neuralgia, to procure sleep, as in nervous watchfulness, and in some cases of delirium tremens. In the latter affection it ought never to be given in excessive doses, and its tendency to stimulate is greatly lessened by combination with tartarated antimony; it is also employed with advantage in certain forms of insanity, such as acute mania, and puerperal mania. *In convulsive and spasmodic diseases*, it has been largely used, as in epilepsy, chorea, tetanus, puerperal convulsions, hooping-cough, spasmodic asthma, colic, in all spasmodic affections of the alimentary canal, in spasmodic stricture of the urethra. *In diseases affecting the respiratory organs*, when carefully administered, it is of advantage, as in catarrh, influenza, phthisis, spasmodic asthma, and hooping-cough, besides the inflammatory affections of the respiratory organs. In some cardiac affections. *In diseases affecting the alimentary canal* it is frequently used, as in certain forms of vomiting, gastralgia, ulcer of the stomach, diarrhœa, cholera, dysentery, intussusception, strangulated hernia. *In diseases affecting the genito-urinary organs*, it is employed, as in inflammatory affections of the kidney, to allay the irritation produced by calculi in any part of the urinary canal, in inflammatory affections and irritable conditions of the bladder, and of the uterus and its appendages, and in functional derangements of these organs at the periods of menstruation, pregnancy, and delivery. *In diseases affecting the organs of locomotion*, it is used, as in rheumatism, gout, and mortification of the extremities. Besides the diseases now mentioned, opium and its preparations are given in very many others, such as cancer, hemorrhages, chronic coughs, during the passage of calculi through the gall ducts or ureters, in diabetes mellitus or insipidus, in hydrophobia, in ptyalism, in venereal diseases, as antidotes in poisoning by Belladonna and Stramonium, and in irritant poisoning, &c. &c. As topical applications, opiates are applied in superficial neuralgic affections, in certain irritable cutaneous diseases, in affections of the eye, ear, and throat, in toothache, in pleurodynia, rheumatic pains, &c. *Endermically*, they are frequently applied by first removing the cuticle by means of a blister, and then sprinkling the exposed surface with morphia or other preparations; and *hypodermically*, by injecting into the subcutaneous cellular tissue a solution of the officinal injectio morphiæ hypodermica, or of any other non-irritating preparation of this drug, such as the bimeconate. Enemata, suppositories, fomentations, and plasters, are other modes of local application.

4. In many of the diseases mentioned as suitable for treatment by opiates, there may be conditions in which their employment would be highly injurious, and such cases cannot always be met by general rules; there are, however, certain signs which are considered to be contra-indicative of the use of opiates, the chief of which, together with certain modifying circumstances and peculiarities in the operation of these drugs, can be but very briefly mentioned. 1. The circumstances which modify the effects of opium are divisible into those which are attributable to the patient, and others which belong to the drug. Of the former, age, sex, temperament, idiosyncrasy, habit, and condition, are the chief; *infants and children* are very susceptible of the influence of opium, and alarming symptoms are sometimes produced by the smallest doses; women are commonly more excited than men by opiates, and when unaccustomed to the drug, do not tolerate it in so large doses; nervous temperaments are sometimes soothed, but often highly excited by opiates, melancholic patients are less influenced by them, whilst those of sanguine temperament are usually most uniformly affected. By idiosyncrasy, some patients cannot take the smallest dose of opium, or any of its preparations, without suffering great discomfort, and it is essential to ascertain whether such be the case before prescribing opiates to a stranger; in these cases other drugs may be substituted; by habit persons may acquire the power of taking enormous doses without producing poisonous symptoms; some diseases, especially those attended by severe pain or spasm, increase the tolerance of opium to a considerable degree. Of the latter, the cultivation, purity, age, pharmaceutical form, and combination with other drugs, modify the effects of opiates. 2. Opiates are, as a general rule, contra-indicated under the following circumstances:—When there is a tendency to sopor or coma, and especially when the pupil is contracted; in plethoric constitutions, with congestion of the cerebral vessels; in cases of venous congestion; in pulmonary affections when the expectoration is scanty and difficult, and also in certain conditions in which there is a copious secretion from the air-passages, in kidney diseases, nursing women, and intoxicated persons. In inflammatory diseases, whilst it is given to allay pain, it must not be allowed to stupefy the patient and mask the disease. As an antiphlogistic in such cases it must be combined with other drugs of more direct action, and it is more useful in membranous than in parenchymatous inflammations.

*Antidotes.*—Treatment of opium poisoning is of great importance, as it is so frequent, and as there is no reliable chemical or complete physiological antidote, prompt and careful treatment is necessary.

Indications for treatment are three in number. 1. To remove the poison from the stomach, to do this employ the stomach pump, siphon, or stimulant emetic, as mustard, salt, zinc sulphate, but not tartar emetic, as it is too depressing in its action. 2. To neutralise it chemically, but there is no reliable chemical antidote, the best is infusion of galls or tannic acid, which, however, only delay and do not prevent its absorption, hence means must be employed to obviate its injurious effects. 3. Maintain respiration by administering shocks to the patient, by shouting, flagellation, cold affusion, galvanism, keeping him walking, and administer strong coffee, and inject hypodermically, ⅙ gr. of atropiæ sulphate every twenty minutes according to the urgency of case, because these are antagonistic to the effects of opium on the nervous and respiratory systems, and as death from opium is due to paralysis of respiration, these remedies, by directly stimulating the respiratory function, are capable of warding off the result in some cases.

MORPHIA — ($C_{17}H_{19}NO_3$). — Morphia is the most important constituent of opium, and is present as a meconate from 6 to 15 per cent. Morphia being very insoluble in water, is not officinal. It is obtained in the process for the preparation of its officinal salts, the hydrochlorate. Morphia occurs in brilliant, colourless, six-sided prisms, with dihedral terminations; but it is commonly met with as a white powder. Morphia is nearly insoluble in cold water; boiling water dissolves about one-hundredth of its weight, giving an alkaline solution; it is soluble in forty parts of cold anhydrous alcohol, and in thirty parts of alcohol at 212°. It is dissolved by potash and soda, and by ammonia when added in excess. It is inodorous, but has a very bitter taste. Nitric acid turns it first red, and afterwards yellow. Neutral perchloride of iron gives a greenish-blue colour. It deoxidises iodic acid, setting free iodine, and thus gives a characteristic reddish-brown colour, which in the presence of starch gives the blue iodide of starch, and dissolved in bisulphide of carbon, gives a violet tint.

**Morphiæ Hydrochloras** — ($C_{17}H_{19}NO_3.HCl.3H_2O$) — *Hydrochlorate of Morphia—Morphiæ Murias*, Ed. Dub.

PREPARATION.—*Take of opium sliced,* 1 *pound; chloride of calcium,* ¾ *ounce; purified animal charcoal,* ¼ *ounce; diluted hydrochloric acid,* 2 *fluid ounces, or a sufficiency; solution of ammonia, and distilled water, of each, a sufficiency. Macerate the opium for twenty-four hours* *with two pints of the water, and decant. Macerate the residue for twelve hours with two pints of the water, decant, and repeat the process with the same quantity of the water, subjecting the insoluble residue to strong pressure. Unite the liquors, evaporate on a water-bath to the bulk of one pint, and strain through calico. Pour in now the chloride of calcium, previously dissolved in four fluid ounces of distilled water, and evaporate until the solution is so far concentrated that upon cooling it becomes solid. Envelope the mass in a double fold of strong calico, and subject it to powerful pressure, preserving the dark fluid which exudes. Triturate the squeezed cake with about half-a-pint of boiling distilled water, and the whole being thrown upon a paper filter, wash the residue well with boiling distilled water. The filtered fluids having been evaporated as before, cooled, and solidified, again subject the mass to pressure; and if it be still much coloured, repeat this process a third time, the expressed liquids being always preserved. Dissolve the pressed cake in six fluid ounces of boiling distilled water; add the animal charcoal, and digest for twenty minutes; filter, wash the filter and charcoal with boiling distilled water, and to the solution thus obtained add the solution of ammonia in slight excess. Let the pure crystalline morphia, which separates as the liquid cools, be collected on a paper filter, and washed with cold distilled water until the washings cease to give a precipitate with solution of nitrate of silver acidulated by nitric acid.*

*From the dark liquids expressed in the above process, an additional product may be obtained by diluting them with distilled water, precipitating with solution of potash added in considerable excess, filtering, and supersaturating the filtrate with hydrochloric acid. This acid liquid, digested with a little animal charcoal and again filtered, gives upon the addition of ammonia a small quantity of pure morphia.*

*Diffuse the pure morphia, obtained as above, through two fluid ounces of boiling distilled water placed in a porcelain capsule kept hot, and add, constantly stirring, the diluted hydrochloric acid, proceeding with caution, so that the morphia may be entirely dissolved, and a neutral solution obtained. Set aside to cool and crystallize. Drain the crystals, and dry them on filtering paper. By further evaporating the mother-liquor, and again cooling, additional crystals are obtained.*

*Characters.*—In white flexible acicular prisms of a silky lustre, not changed by exposure to the air, and soluble in water and spirit. The aqueous solution gives a white curdy precipitate with nitrate of silver, and a white one with potash, which is redissolved when an excess of the alkali is added. Moistened with strong nitric acid it becomes orange-red, and with solution of perchloride of iron, greenish-blue. *Dose*, $\frac{1}{6}$ to $\frac{1}{2}$ gr.

LIQUOR MORPHIÆ HYDROCHLORATIS — Solution of Hydrochlorate of Morphia.—*Take of hydrochlorate of morphia, 4 grains; diluted hydrochloric acid, 8 minims; rectified spirit, 2 fluid drachms; distilled water, 6 fluid drachms. Mix the hydrochloric acid, the spirit, and the water, and dissolve the hydrochlorate of morphia in the mixture.* This solution contains half as much morphia as liquor morphiæ hydrochloratis, Lond. *Dose,* 10 to 60 minims.

SUPPOSITORIA MORPHIÆ—Morphia Suppositories.—*Take of hydrochlorate of morphia, 6 grains; benzoated lard, 64 grains; white wax, 20 grains; oil of theobroma, 90 grains. Melt the wax and oil of theobroma with a gentle heat, then add the hydrochlorate of morphia and benzoated lard, previously rubbed together in a mortar, and mix all the ingredients thoroughly. Pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository, which will contain half-a-grain of hydrochlorate or morphia.*

SUPPOSITORIA MORPHIÆ CUM SAPONE—Morphia Suppositories with Soap.—*Take of hydrochlorate of morphia, 6 grains; glycerine of starch, 50 grains; curd soap, in powder, 100 grains; starch, in powder, a sufficiency. Mix the hydrochlorate of morphia with the glycerine of starch and soap, and add sufficient starch to form a paste of suitable consistence. Divide the mass into twelve equal parts, each of which is to be made into a conical or other convenient form for a suppository.*

TROCHISCI MORPHIÆ—Morphia Lozenges.—*Take of hydrochlorate of morphia, 20 grains; tincture of tolu, ½ fluid ounce; refined sugar, in powder, 24 ounces; gum acacia, in powder, 1 ounce; mucilage of gum acacia, a sufficiency; distilled water, ½ fluid ounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with two fluid ounces of the mucilage; then add the gum and the sugar, previously mixed, and more mucilage, if necessary, to form a proper mass. Divide into 720 lozenges, and dry these in a hot-air chamber with a moderate heat.* Each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia.

TROCHISCI MORPHIÆ ET IPECACUANHÆ—Morphia and Ipecacuan Lozenges.—*Take of hydrochlorate of morphia, 20 grains; ipecacuan, in fine powder, 60 grains; tincture of tolu, ½ fluid ounce; refined sugar, in powder, 24 ounces; gum acacia, in powder, 1 ounce;*

*mucilage of gum acacia, a sufficiency; distilled water, ½ fluid ounce. Dissolve the hydrochlorate of morphia in the water; add this solution to the tincture of tolu, previously mixed with two fluid ounces of the mucilage; then add the ipecacuanha, gum, and sugar, previously mixed, and add more mucilage, if necessary, to form a proper mass. Divide into* 720 *lozenges, and dry these in a hot-air chamber with a moderate heat.* Each lozenge contains one thirty-sixth of a grain of hydrochlorate of morphia, and one-twelfth of a grain of ipecacuan.

MORPHIÆ ACETAS—Acetate of Morphia—($C_{17}H_{19}NO_3C_2H_4O_2$).

*Tests.*—A white powder, soluble in water and in spirit. From its solution potash throws down a precipitate which is dissolved by excess of the alkali. It is affected by nitric acid and perchloride of iron in the same way as hydrochlorate of morphia is. When sulphuric acid is added to the salt, acetous vapours are evolved.

LIQUOR MORPHIÆ ACETATIS—Solution of Acetate of Morphia.—*Take of acetate of morphia,* 4 *grains; diluted acetic acid,* 8 *minims; rectified spirit,* 2 *fluid drachms; distilled water,* 6 *fluid drachms. Mix the acid, the spirit, and the water, and dissolve the acetate of morphia in the mixture. Dose,* 10 *to* 60 *minims.*

INJECTIO MORPHIÆ HYPODERMICA—Hypodermic Injection of Morphia.—A solution of acetate of morphia, containing one grain of the acetate in twelve minims of the injection.—*Take of hydrochlorate of morphia,* 88 *grains; solution of ammonia, acetic acid, and distilled water, of each, a sufficiency. Dissolve the hydrochlorate of morphia in two ounces of distilled water, aiding the solution by a gentle heat; then add solution of ammonia, so as to precipitate the morphia and render the liquid slightly alkaline; allow it to cool; collect the precipitate on a filter, wash it with distilled water, and allow it to drain; then transfer the morphia to a small porcelain dish with about an ounce of distilled water; apply a gentle heat, and carefully add acetic acid until the morphia is dissolved, and a very slightly acid solution is formed. Add now sufficient distilled water to make the solution measure exactly two fluid ounces. Filter and preserve the product in a stoppered bottle, excluded from the light. Dose,* 1 *to* 6 *minims.*

*Action of Morphia and its Salts.*—The physiological action of opium is but the aggregate of its separate active principles, yet its peculiar powers are represented chiefly by morphia. But the action of the other principles, which differs considerably, must, when combined, modify their general effect, so that the action of opium and morphia must differ somewhat in kind as well as degree. *In degree*, as ⅙ to ¼ gr. of morphia is equal to 1 gr. of opium. *In kind*, morphia differs from opium in being less stimulant, less convulsant, less diaphoretic and constipating. But it is more anodyne, and, in less doses, less apt to cause disagreeable after-effects, and more liable to paralyse the bladder and cause pruritus of the skin. *Morphia* is, therefore, used principally as an anodyne and antispasmodic, its advantages being, smaller doses, and the solubility of its salts rendering it suitable for hypodermic employment; when its speedy action is desired, or when necessary to save the stomach, and when patients won't and can't swallow it. *Contra-indication* and antidote, see Opium.

*As to the other peculiar* constituents of opium, so many different and even opposite opinions have been given as to their actions—due probably to the want of purity of the alkaloids used, and different animals being experimented upon, that we cannot at present consider their physiological actions at all settled, with one or two exceptions. Thus. *Alkaloids*—

*Codeia* ($C_{18}H_{21}NO_3$).—A feeble hypnotic; 4 grs. equal 1 gr. of morphia, and after-effects less disagreeable.

*Thebaia* (Paramorphia) ($C_{19}H_{21}NO_3$).—A pure convulsant; 2 grs. equal 1/30 gr. of strychnine.

*Narcotine* ($C_{22}H_{23}NO_7$).—No hypnotic action; simply a bitter tonic. *Dose*, 5 to 20 grs.

$$\left.\begin{array}{l}\text{Papaverine } (C_{20}H_{21}NO_4)\\ \text{Cryptopia } (C_{23}H_{25}NO_5)\end{array}\right\}\text{ Feebly narcotic (HARLEY).}$$

*Neutral Bodies*—

$$\left.\begin{array}{l}\text{Narcein } (C_{23}H_{29}NO_9)\\ \text{Meconine } C_{10}H_{10}O_4)\end{array}\right\}\text{ Hypnotic.}$$

*Apomorphia* ($C_{17}H_{17}NO_2$), obtained by heating morphia in a closed tube, with excess of HCL. The morphia loses one atom of water, leaving apomorphia. It is a snow-white salt, very unstable, rapidly becoming green on exposure. The hydrochlorate is a more permanent salt, and hence is preferred for use.

Its action is that of an emetic, whether given by the mouth or subcutaneous injection, by a stimulant action on the nerve centres. Vomiting occurs in from two to twenty minutes, and recurs at intervals of ten to fifteen minutes for half-an-hour. *Dose*, by mouth, 1/10 to ⅙ gr.; hypodermically, 1/20 to 1/10 dissolved in water, and the solution should be freshly prepared.

In a few cases, instead of vomiting it has caused startling symptoms, especially syncope, so that care must be exercised in its employment.

*Meconic Acid* ($C_7H_4O_7$), Tribasic, crystalline pearly micaceous scales, 4 to 8 per cent., inert alone, but probably modifies the action of morphia, with which it is combined, and is very important from a medico-legal point of view, as in testing for the presence of opium. The tests applied are for meconic acid and morphia.

*Tests.*—The persalts of iron give, with meconic acid, a blood-red colour (to a portion of the solution add a solution of corrosive sublimate, and the colour is not destroyed), to another portion add hydrochloric acid, and the colour is discharged. These reagents act on sulpho-cyanate of iron, which has a similar colour in exactly the opposite manner.

**CRUCIFERÆ or BRASSICACEÆ**—Cruciferous or Cabbage Order.—Herbaceous, or very rarely shrubby plants, widely distributed, but abounding in cold, temperate climates, especially in Europe. The order contains many useful culinary vegetables, but not one poisonous plant. The plants generally possess acrid, pungent, and antiscorbutic properties. Officinal plants : *Sinapis nigra, Sinapis albi, Cochlearia Armoracia.*

*Botany.*—Indigenous annuals. *Sinapis nigra.*—*Stem,* smooth, branched, three or four feet in height. *Leaves : lower,* large, lyrate, rough, lobed, and toothed ; *upper,* petioled, smooth, narrow, lanceolate, entire. *Inflorescence,* yellow flowers. *Pods,* quadrangular, smooth, pressed to the stem. *Seeds,* numerous, round, shining, dark-brown. *Flowering time,* June and July. *Habitat,* indigenous, waste places and fields ; cultivated. *Sinapis alba.*—*Root,* small and tapering. *Stem,* erect, branched, rough, hirsute, eighteen inches to two feet high. *Leaves,* bright green, lyrate, deeply cut, roughish. *Inflorescence,* large yellow flowers, in terminal spikes or racemes. *Pods,* bristly, short, two-edged, tumid, with long beak. *Seeds,* rather large, not numerous, yellowish-brown. *Flowering time,* July. *Habitat,* indigenous, waste places and corn-fields ; cultivated.

**Sinapis**—Mustard.—The seeds of *Sinapis nigra* and *Sinapis alba,* Black and White Mustard. The seeds reduced to powder, mixed ; cultivated in England.

*Characters of the Powder.*—Greenish-yellow, of an acrid, bitterish, oily, pungent taste, scentless when dry, but exhaling, when moist, a pungent, penetrating, peculiar odour, very irritating to the nostrils and eyes.

*Composition.*—Both black and white mustard seeds yield by pressure 25 to 30 per cent. of a bland fixed oil; but the oleum sinapis B. P. or volatile oil can only be obtained from the seeds of S. nigra by distillation with water, and does not exist ready formed. The reaction which yields the oil was explained by Will and Körner, 1863—viz., The black seeds contain a crystallisable substance, myronate of potassium (or sinigrin) and an albuminous ferment, myrosin, which, in the presence of water, attacks the myronate of potassium and breaks it up into the volatile oil of mustard, sulphate of potash and glucose, *e.g.* ($KC_{10}H_{18}NS_2O_{10}=C_3H_5CNS+KHSO_4+C_6H_{12}O_6$)—this being the active principle of the black seeds. The white seeds also contain myrosin, but no myronate of potassium, hence do not yield the volatile oil; but they contain sinalbin, which acted upon by myrosin, in presence of water, breaks up into sulphocyanate of acrinyl, &c., which is the rubefacient principle of the white seeds.—(Will and Körner, 1876.) Thus—($C_{30}H_{44}N_2S_2O_{16}=C_8H_7NSO+C_{16}H_{25}NSO_9+C_6H_{12}O_6$). The active properties of black and white mustard seeds depend, therefore, respectively on the volatile oil and sulphocyanate of acrinyl.

CATAPLASMA SINAPIS—Mustard Poultice.—*Take of mustard, in powder, 2½ ounces; linseed meal, 2½ ounces; boiling water, 10 fluid ounces. Mix the linseed meal gradually with the water, and add the mustard, with constant stirring.*

CHARTA SINAPIS—Mustard Paper.—*Take of black mustard seeds, in powder, 1 ounce; solution of gutta-percha, 2 fluid ounces, or a sufficiency. Mix the mustard with the gutta-percha solution, so as to form a semi-fluid mixture, and having poured this into a shallow flat-bottomed vessel, such as a dinner plate, pass strips of cartridge paper over its surface, so that one side of the paper shall receive a thin coating of the mixture; then lay the paper on a table with the coated side upwards, and let it remain exposed to the air until the coating has hardened. Before being applied to the skin, let the mustard paper be immersed for a few seconds in tepid water.*

OLEUM SINAPIS—Oil of Mustard.—The oil distilled with water from the seeds of Black Mustard, *Sinapis nigra*, Linn., after the expression of the fixed oil.

*Characters.*—Colourless or pale yellow. Specific gravity, 1·015. Dissolves readily in alcohol and ether, and to a slight extent in water. Has an intensely penetrating odour, and a very acrid, burning taste. Applied to the skin, it produces almost instant vesication.

LINIMENTUM SINAPIS COMPOSITUM—COMPOUND LINIMENT OF MUSTARD.—*Take of oil of mustard,* 1 *fluid drachm; ethereal extract of mezereon,* 40 *grains; camphor,* 120 *grains; castor oil,* 5 *fluid drachms; rectified spirit,* 4 *fluid ounces. Dissolve the extract of mezereon and camphor in the spirit, and add the oil of mustard and castor oil.*

*Therapeutics.*—Mustard is largely used as a condiment, and as such promotes digestion by exciting the secretion of gastric juice. It also acts as a stimulant, quickening the circulation, and, when continued, increasing the secretions of the skin and kidneys. In larger doses (one or two tea-spoonfuls in a tumblerful of warm water) it acts as a stimulating emetic, producing but little subsequent depression. Externally it acts as an irritant, rubefacient, and vesicant, and will readily produce more serious effects if carelessly applied; hence, when a mustard poultice is applied to a patient who is insensible, and in young children and delicate persons, it is important to watch its effects from time to time, and above all, not to *forget it.* As an emetic it is useful in narcotic poisoning, and in other lethargic, debilitated, and congested conditions, in which it is of importance to empty the stomach and arouse the vital powers promptly, without causing subsequent depression. Topically, mustard is of great use as a counter-irritant and derivative and stimulant cataplasm in a vast number of cases. Mustard is sometimes added with advantage to a warm bath in the case of children with retrocedent skin eruptions, or suffering from severe bronchitis. A mustard sitz-bath is also frequently beneficial in amenorrhœa, while mustard pediluvia are found useful in alleviating headache, diminishing congestion of the head, and lessening inflammation of internal organs. The liniment is vesicating and stimulating, and is used, either alone or diluted with an equal bulk of olive oil or glycerine, to rub over scrofulous glands, over the chest in pleurodynia, for cases of lumbago and sciatica, and in chronic sprains. The objections to its use are, that it is both expensive and liable to deteriorate on keeping through escape of the volatile oil.

**Armoraciæ Radix**—Horse-radish Root.—Officinal Plant: *Cochlearia Armoracia,* Linn. Officinal part: The fresh root; cultivated in Britain.

*Botany.*—Perennial. *Root,* long, white, cylindrical, pungent (see p. 160, where it is compared with the root of Monkshood). *Stem,* erect, round, branches about two feet in height. *Leaves,* the radical leaves are large, oblong, crenate, dark green; those of the stem are smaller, sessile, lanceolate. *Inflorescence*, flowers numerous, white, racemose. *Flowering time*, May. *Habitat*, occasionally in waste places; chiefly cultivated.

*Characters.*—A long, cylindrical, fleshy root, half-an-inch to one inch in diameter, expanding at the crown into several very short stems. It is internally white, and has a pungent taste and smell.

*Active Constituents.*—Similar to those of the seeds of black mustard—namely, myrosin and myronic acid, which, with the water, produce an exceedingly pungent, powerful, and odorous *volatile oil.* Active in spring and autumn, when carefully preserved in the fresh state.

SPIRITUS ARMORACIÆ COMPOSITUS—COMPOUND SPIRIT OF HORSE-RADISH.—*Take of horse-radish, scraped, bitter orange-peel, cut small and bruised, of each,* 20 *ounces; nutmeg, bruised,* ½ *ounce; proof spirit,* 1 *gallon; water,* 2 *pints. Mix, and distil a gallon with a moderate heat.*

*Dose.*—One to two fluid drachms as an adjunct to other medicines.

*Therapeutics.*—Horse-radish acts much like mustard, as a stimulant, diuretic, and diaphoretic, &c. It is used as a condiment, and promotes digestion. It is not much used as a medicine; the compound spirit may be added, as a stimulant, diuretic, or diaphoretic, to other medicines. It has also been employed as a sialagogue, and in relaxed sore throats as a gargle.

**POLYGALACEÆ**—Milkwort Order.—Herbs or shrubs widely scattered over the world. The Plants are generally bitter and acrid, and have milky roots. Medicinally, they are expectorant, sudorific, diuretic, purgative, tonic, and astringent. Officinal plants: *Polygala Senega, Krameria Triandra.*

**Senegæ Radix**—Senega Root.—Officinal Plant: *Polygala Senega;* Snake-root, Rattlesnake Milkwort, Senega, or Seneka Snake-Root. Officinal part: The dried root; from North America.

*Characters.*—A knobby root-stock, with a branched tap-root, of about the thickness of a quill, twisted and keeled; bark yellowish-brown, sweetish, afterwards pungent, causing salivation; interior woody, tasteless, inert.

*Active Constituent.*—Polygalic acid or senegin, a glucoside ($C_{36}H_{24}O_{30}$). Polygalic acid is obtained from the cortical part of the root only; when pure it is a white powder, inodorous, and at first tasteless, but afterwards intensely acrid, causing an unpleasant feeling of constriction of the fauces. Eight-grain doses caused the death of dogs in three hours.

INFUSUM SENEGÆ—INFUSION OF SENEGA.—*Take of senega root, bruised, ½ ounce; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* 1 *to* 2 *oz.*

TINCTURA SENEGÆ—TINCTURE OF SENEGA.—*Take of senega root, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the senega for forty-eight hours, in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ʒii.

*Therapeutics.*—Senega acts as a stimulating expectorant. Of all the therapeutic actions attributed to senega, the expectorant is the only one of which there is reliable proof. In larger doses it operates as an emetic or purgative, and is apt to produce troublesome salivation. It is chiefly used in chronic bronchial and pulmonary inflammations, especially in old people with copious secretion, in cases which require stimulation rather than depletion. It may be combined with ammonia, squill, &c., or, in more acute cases, with tartar emetic.

**Krameriæ Radix**—Rhatany Root.—Officinal plant: *Krameria triandra;* Peruvian or Payta Rhatany. Officinal part: The root dried; imported from Peru.

*Characters of the Root.*—About an inch in diameter, branches numerous, long, brownish-red and rough externally, reddish-yellow internally, strongly astringent, tinging the saliva red.

*Active Constituents.*—Rhatania—tannic acid, 20 per cent., and no gallic acid. It is an amorphous powder, is not affected by tartar emetic, but with FeCl gives a dark-greenish precipitate, and is decomposed by dilute acids with sugar and rhatania red.

EXTRACTUM KRAMERIÆ—EXTRACT OF RHATANY.—*Take of rhatany root, in coarse powder,* 1 *pound; distilled water, a sufficiency. Macerate the rhatany in a pint and a-half of the water for twenty-four hours; then pack in a percolator, and add more distilled water, until twelve pints have been collected, or the rhatany is exhausted. Evaporate the liquor by a water-bath to dryness. Dose,* 5 *to* 20 *grs.*

INFUSUM KRAMERIÆ—INFUSION OF RHATANY.—*Take of rhatany root, bruised, ½ ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* 1 *to* 2 *oz.*

TINCTURA KRAMERIÆ—Tincture of Rhatany.—*Take of rhatany root, in coarse powder, 2½ ounces; proof spirit, 1 pint. Macerate the rhatany root for forty-eight hours, in fifteen ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒii.

*Therapeutics.*—Rhatany acts as a pure vegetable astringent. It is employed to check excessive mucous secretions, passive hemorrhages, &c., and is useful in diarrhœa, dysentery, hæmaturia, passive hemorrhage from the bowels, as a gargle in relaxed sore throat, internally, and as an injection in leucorrhœa, as an astringent application to the mucous membrane of the nose, eyes, gums, &c. Externally, it is applied to discharging ulcers, to arrest hemorrhage from small vessels, &c.

**MALVACEÆ**—The Mallow Order.—Herbs, shrubs, or trees inhabiting tropical and the warmer parts of temperate regions. The plants are generally mucilaginous and demulcent, and are not deleterious.

GOSSYPIUM—Cotton Wool.—The hairs of the seed of various species of Gossypium, *Linn.*, carded. Cotton Wool is prepared by carding the hairs of the seeds of various species of the genus *Gossypium.*

*Therapeutics.*—Each filament, the mass of which constitutes cotton wool, in the recent state is tubular, but becomes flattened on drying. Under the microscope they present the appearance of long, narrow, flattened ribbons, with occasional joints, indicated by lines passing across them at nearly right angles to the margin. In this they differ from linen, the fibres of which have tapering extremities, and their joints are oblique. Cotton is a modification of lignine, and in its chemical properties resembles woody fibre. Cotton is employed as an application to blistered surfaces, and to burns; it is applied in thin layers firmly and evenly to the part; and as the object is to form with the secretions an impenetrable covering, which is for a time to supply the protection previously provided by the cuticle, it should be as little disturbed as possible. A spirituous or turpentine lotion is sometimes applied to extensive burns previous to covering the parts with cotton. The outer layers, for cleanliness, may be occasionally removed, but the layer in contact with the wound should be allowed to remain undisturbed for several days.

### **Pyroxylin**—Gun Cotton.

PREPARATION.—*Take of cotton,* 1 *ounce; sulphuric acid, nitric acid, of each,* 5 *fluid ounces. Mix the acids in a porcelain mortar, immerse the cotton in the mixture, and stir it for three minutes with a glass rod, until it is thoroughly wetted by the acids. Transfer the cotton to a vessel containing water, stir it well with a glass rod, decant the liquid, pour more water upon the mass, agitate again, and repeat the affusion, agitation, and decantation, until the washing ceases to give a precipitate with chloride of barium. Drain the product on filtering paper, and dry in a water-bath.*

### **Collodium**—Collodion.

PREPARATION.—*Take of pyroxylin,* 1 *ounce; ether,* 36 *fluid ounces; rectified spirit,* 12 *fluid ounces. Mix the ether and the spirit, and add the pyroxylin. Set aside for a few days, and should there be any sediment, decant the clear solution. Keep it in a well-corked bottle.*

*Characters.*—A colourless highly inflammable liquid, with ethereal odour, which dries rapidly upon exposure to the air, and leaves a thin transparent film, insoluble in water or rectified spirit.

COLLODIUM FLEXILE—FLEXIBLE COLLODION.—*Take of collodion,* 6 *fluid ounces; Canada balsam,* 120 *grains; castor oil,* 1 *fluid drachm. Mix, and keep in a well-corked bottle.*

*Therapeutics.*—It is of syrupy consistence. When applied to the skin, it immediately dries and contracts, forming a thin transparent protective covering. The rapidity with which it dries is apt to make it crack and curl up, leaving part of the surface it is intended to protect bare, and to obviate this tendency the Collodium Flexile has been introduced. Three hundred parts of collodion, twelve of Venice turpentine, and six of castor oil, make also a very pliable collodion (SQUIRE). Castor oil alone, or glycerine, may be added for the same purpose. Collodion is employed to form a protective covering to inflamed surfaces, sores, chaps, skin diseases, burns, &c.; it is also used to protect and to promote the adhesion of simple incised wounds to prevent pitting in smallpox, to arrest hemorrhage from trifling superficial wounds and leech bites, as a stopping to decayed teeth, &c. Pills are sometimes coated with collodion.

## **BYTHNERIACEÆ**—The Chocolate Order.

### *OLEUM* THEOBROMÆ—Oil of Theobroma—Cacao Butter.

*A concrete oil obtained by expression and heat from the ground seeds of Theobroma Cacao,* Linn.

*Characters.*—Of the consistency of tallow; colour yellowish; odour resembling that of chocolate; taste bland and agreeable, Fracture clean, presenting no appearance of foreign matter. Does not become rancid from exposure to the air. Melts at a temperature of 122°.

Cacao butter softens, without quite fusing, at the temperature of the body, and has no irritating properties.

*Therapeutics.*—It is used in the preparation of suppositories, pessaries, ointments, soaps, &c., and also as an application to chapped lips and hands. It has been recommended internally as a substitute for cod-liver oil in cases in which the objections to the latter are insuperable.

**AURANTIACEÆ**—The Orange Order.—Trees or shrubs, chiefly East Indian plants. The pulp of the fruit has an acid and saccharine taste, the leaves and rind contain a volatile, fragrant oil, which is used in flavouring, in perfumery, and for other purposes. The rind also contains a tonic principle. Officinal plants: *Citrus Bigaradia, Citrus Aurantium, Citrus Limonum, Ægle Marmelos.*

**Aurantii Fructus**—THE RIPE FRUIT OF CITRUS BIGARADIA. —The Seville or Bitter-Orange Tree; growing in Southern Europe, Spain, &c.

**Aurantii Cortex**—BITTER-ORANGE PEEL.—Citrus Bigaradia. The outer part of the rind, dried, from the ripe fruit, imported from the south of Europe.

*Characters.*—Thin, of a dark orange colour, nearly free from the white inner part of the rind; having an aromatic bitter taste, and fragrant odour.

**Aqua Aurantii Floris**—ORANGE-FLOWER WATER.—Water distilled from the flowers of Citrus Bigaradia and Citrus Aurantium, the Bitter and Sweet Orange Trees, prepared mostly in France. *Dose,* 1 to 2 fluid oz.

INFUSUM AURANTII—INFUSION OF ORANGE PEEL.—*Take of bitter orange peel, cut small,* ½ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for fifteen minutes, and strain. Dose,* 1 *to* 2 *fluid oz.*

INFUSUM AURANTII COMPOSITUM—COMPOUND INFUSION OF ORANGE PEEL. *Dose,* 1 to 2 fluid oz.

Preparation.—*Take of bitter orange peel, cut small, ½ ounce; fresh lemon peel, cut small, 60 grains; cloves, bruised, 30 grains; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel for a quarter of an hour, and strain.*

SYRUPUS AURANTII—Syrup of Orange Peel.—*Take of tincture of orange peel, 1 fluid ounce; syrup, 7 fluid ounces. Mix. Dose, ʒi. to ʒii.*

SYRUPUS AURANTII FLORIS—Syrup of Orange Flower.—*Take of orange-flower water, 8 fluid ounces; refined sugar, 3 pounds; distilled water, 16 fluid ounces, or a sufficiency. Dissolve the sugar in the distilled water by means of heat; strain, and when nearly cold add the orange-flower water, with a sufficient quantity of distilled water, if necessary, to make the product four pounds and a-half. The specific gravity should be 1·330. Dose, ʒi. to ʒii.*

TINCTURA AURANTII—Tincture of Orange Peel.—*Take of bitter orange peel, cut small and bruised, 2 ounces; proof spirit, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation, then strain, press, and filter, and add sufficient proof spirit to make one pint.* This tincture is used in the formation of *Mistura Ferri Aromatica, Syrupus Aurantii,* and *Tinctura Quiniæ. Dose, ʒss. to ʒii.*

TINCTURA AURANTII RECENTIS—Tincture of Fresh Orange Peel.—*Take of bitter orange and rectified spirit, of each, a sufficiency. Carefully cut from the orange the coloured part of the rind in thin slices, and macerate six ounces of this in a pint of the spirit for a week, with frequent agitation. Then pour off the liquid, press the dregs, mix the liquid products, and filter; finally, add sufficient spirit to make one pint. Dose, ʒi. to ʒii.*

VINUM AURANTII—Orange Wine.—Wine made in Britain, by the fermentation of a saccharine solution to which the fresh peel of the bitter orange has been added; it contains about 12 per cent. of alcohol. *Dose,* ʒii. to ℥ss.

*Therapeutics.*—Orange peel and its preparations are commonly employed as aromatic, tonic, and stomachic, or flavouring adjuncts to, or vehicles for, other remedies, their activity depending on a bitter principle, Hesperidin, and a volatile oil, in addition to which the rind contains a little tannic acid. From the flowers of both varieties is obtained a volatile oil, termed *Oil of Orange flowers,* or *Oil of Neroli;* and from the rind also of both varieties is obtained, by expression, a volatile oil, termed *Oil of orange,* or *Oil of Portugal.* In all cases the oil obtained from the bitter orange is the more esteemed variety. They and their distilled waters are stimulant and antispasmodic. Orange-flower water, added to preparations of iron, is often beneficial in enabling anæmic patients to bear them, whereas they cannot take chalybeate preparations administered alone, on account of their too great stimulant action. Orange juice, either directly from the fruit, or diluted with water and sweetened with sugar, is given as a refrigerant in febrile and inflammatory cases.

**Limonis Cortex**—Lemon Peel.—The fresh outer part of the rind of the fruit of Citrus Limonum; Southern Europe.

*Characters.*—In thin slices, of a yellow colour, dotted with numerous vesicles of oil, with a fragrant odour, and aromatic, slightly bitter taste.

**Limonis Oleum**—Oil of Lemon.—The oil expressed or distilled from the fresh Lemon Peel; imported chiefly from Sicily ($C_{10}H_{16}$).

*Characters.*—Colour, pale yellow; odour, agreeable; taste, warm and bitter. *Dose*, 1 to 5 mins.

**Limonis Succus**—Lemon Juice.—The expressed juice of the ripe fruit of Citrus Limonum.

*Characters.*—A slightly turbid yellowish liquor, possessing a sharp acid taste, and grateful odour. Average specific gravity, 1·039. Average quantity of citric acid in one fluid ounce, 32·5 grains.

Lemon juice is expressed from the pulp after the removal of the rind and seeds, and after standing for a day or two in a cool place, it is decanted and filtered. It contains citric acid, malic acid, mucilage, salts, part of which is potash, and a little phosphoric acid, bitter extractive, and water. It is prone to decomposition when exposed to the air, but may be preserved for a long time, either by keeping it in full and well-corked bottles, or by covering it with a layer of oil; it may also be preserved by the addition of one-tenth part of spirit of wine; one-tenth of strong brandy being added to that which supplies the navy. In all cases the mucilage must be removed as much as possible by filtration, and it must afterwards be kept secluded from the air. Factitious lemon juice is sometimes prepared from citric acid, with the addition of a little oil of lemon.

SYRUPUS LIMONIS—Syrup of Lemons.—*Take of fresh lemon peel, 2 ounces; lemon juice, strained, 1 pint; refined sugar, 2¼ pounds. Heat the lemon juice to the boiling point, and, having put it into a* *covered vessel with the lemon peel, let them stand until they are cold, then filter and dissolve the sugar in the filtered liquid with a gentle heat. The product should weigh three pounds and a-half, and should have the specific gravity* 1·34. *Dose,* ʒi. *to* ʒii.

TINCTURA LIMONIS—TINCTURE OF LEMON PEEL.—*Take of fresh lemon peel, sliced thin,* 2½ *ounces; proof spirit,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation; strain, press, and filter; then add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ʒii.

*Therapeutics.*—Lemon peel and the preparations made from it are employed as adjuncts to other medicines, affording an agreeable flavour and a somewhat aromatic, tonic, and stomachic effect. Oil of lemons is seldom used internally, except as it enters into aromatic spirit of ammonia; it acts as a stimulant and a carminative. Externally, it acts as a stimulant and a rubefacient. Lemon juice is classed with refrigerants, sedatives, antiscorbutics, and antidotes. Oil of lemons has been employed as a topical stimulant application to the eye in rheumatic and scrofulous ophthalmia, and it may be taken internally as a carminative, in doses of two or three drops, either added to other medicines or dropped upon sugar. Lemon juice has been given in the form of a drink, as a sedative and refrigerant, in febrile and inflammatory diseases. In acute rheumatism it has been recommended by Dr. Owen Rees on the supposition that it eliminates such elements as tend to produce uric acid in the form of urea and carbonic acid by supplying them with oxygen. This is not, however, borne out by the results of clinical experience, but it is sometimes useful if neutralised with potash or soda when it is eliminated, as a carbonate rendering the urine alkaline. In the form of effervescing lemonade, or an effervescing draught, it is given to allay vomiting. It is given as an antiscorbutic in scurvy, both as a prophylactic and curative agent, and is equalled by no other remedy except a liberal supply of pure vegetables of the cruciferæ. On long voyages 1 to 1½ ounce daily is a prophylactic dose, while as a curative agent 4 to 6 ounces daily will be required. Next to it in efficacy ranks citric acid, on which probably the major part of the curative action of lemon juice in scurvy depends. It is given as an antidote in narcotic poisoning, and in poisoning with caustic alkalies. It has also been given in acute dysentery and diarrhœa, in dropsical affections, &c.

Of the juice, two fluid drachms to a fluid ounce or more; in rheumatism and scurvy, four or more ounces daily. *Lemonade.*—

Slice two lemons, add two ounces of sugar, pour over them a pint of hot water, and when cool, strain; dose, *ad libitum.* *Aerated* or *Effervescing Lemonade* is made by adding lemon syrup to water, and charging it with five times its volume of carbonic-acid gas. *Effervescing Draughts* may be made in the following proportion: to half-an-ounce of lemon juice (equal to seventeen grains of citric acid)—carbonate of soda, thirty-five grains; carbonate of potash, twenty grains; carbonate of ammonia, fifteen grains; bicarbonate of soda, twenty grains; bicarbonate of potash, twenty-five grains.

**Belæ Fructus**—Bael Fruit—The half-ripe fruit, dried, of the Ægle Marmelos; from Malabar and Coromandel.

*Characters.*—Fruit roundish, about the size of a large orange, with a hard woody rind; usually imported in dried slices, or in fragments consisting of portions of the rind and adherent dried pulp and seeds. Rind about a line and a-half thick, covered with a smooth pale-brown or greyish epidermis, and internally, as well as the dried pulp, brownish-orange, or cherry-red. The moistened pulp is mucilaginous.

EXTRACTUM BELÆ LIQUIDUM—Liquid Extract of Bael. *Dose,* ʒi. to ʒiv.

*Therapeutics.*—Bael is given as an astringent in diarrhœa and dysentery, chronic irritation of the bowels, but as it contains no astringent principle it would be better left out of the Pharmacopœia.

**GUTTIFERÆ**—The Gamboge Order.—Trees or shrubs, inhabiting tropical regions only, and more frequently in moist places. The plants yield a yellow gum resin, which is acrid and purgative. The genus *Garcinia* affords the officinal gamboge.

**Cambogia**—Gamboge.—A gum-resin obtained from Garcinia Morella, *Desrous.* var. pedicellata. Imported from Siam.

*Characters of Siam Gamboge.*—In cylindrical pieces, breaking easily with a smooth conchoidal glistening fracture; colour tawny, changing to yellow when it is rubbed with water; taste acrid. Siam or commercial gamboge is met with in two forms, namely, as pipe gamboge, and as lump or cake gamboge. Pipe gamboge is generally the better variety. Pipe gamboge may be either solid or hollow, and receives its cylindrical form by being poured whilst soft into bamboo stems; it is met with in pieces varying in length and thickness, and sometimes doubled upon themselves or agglutinated. Externally, it is generally striated and covered with a dirty greenish-yellow dust, derived from the pressure and contents of the bamboo. Gamboge is inodorous, and at first tasteless, but in a little while causes an acrid sensation in the throat, and the dust arising when it is powdered is very irritating to the nostrils. The powder is of a bright yellow colour. Gamboge is but slightly soluble in water, but when mixed with it, forms a yellow emulsion. By the successive action of ether and water, fine gamboge is completely dissolved, the resin being dissolved by the former, the gum by the latter. Rectified spirit dissolves the resin, which is precipitated on the addition of water, and again dissolved by a solution of potash, forming a clear red solution of gambogiate of potash.

*Active Constituents.*—Gambogic acid, or resin of gamboge ($C_{20}H_{24}O_4$), about 70 to 75 per cent. in the finer qualities; gum (*Arabin*), about 20 to 25 per cent.; with a variable quantity of moisture.

PILULA CAMBOGIÆ COMPOSITA—COMPOUND PILL OF GAMBOGE.—*Take of gamboge, in powder, Barbadoes aloes, in powder, compound powder of cinnamon, of each,* 1 *ounce; hard soap, in powder,* 2 *ounces; syrup, a sufficiency. Mix the powders together, add the syrup, and beat the whole into a uniform mass. Dose,* 5 *to* 15 *grains.*

*Dose.*—Of powdered gamboge, 1 to 5 grains.

*Therapeutics.*—Gamboge in medicinal doses is a drastic hydragogue cathartic, and in over-doses an irritant poison, causing vomiting, hypercatharsis, severe tormina, inflammation, ulceration and mortification of the intestines, and fatal exhaustion. Treatment of an overdose, demulcent drinks and opiates. It is very rarely given alone, but either in combination with warm aromatic purgatives as in the compound pill, or with calomel, cream of tartar, or jalap, in the treatment of dropsies, or as an adjunct to diuretic mixtures. Its use is contra-indicated in children, in debilitated persons, in pregnancy, and in all inflammatory and irritable states of the alimentary canal or adjoining viscera. It has been given also as a counter-irritant purgative in cerebral affections, and as an anthelmintic in tapeworm. But it is gradually falling out of use. It is not so hydrogogue as elaterium or jalap, while it is more disagreeable in its operation.

**CANELLACEÆ.**—The genus *canella* has been placed by Martius in a separate order; some botanists have placed it in the *Guttiferæ*, others in the *Meliaceæ.*

CANELLÆ ALBÆ CORTEX.—The bark of *Canella Alba*; the laurel-leaved Canella—Wild Cinnamon—Spurious Winter's Bark.

*Characters.*—In quills or broken pieces, hard, of a yellowish-white or pale orange colour, somewhat lighter on the internal surface. It has an aromatic clove-like odour, and an acrid peppery taste. It owes its activity to a volatile oil, a bitter principle, and mannite.

*Therapeutics.*—Canella acts as an aromatic stimulant and tonic. It is seldom used alone, but generally as an adjunct to other tonics, or as a corrigent to resinous purgatives. It is used in the preparation of Vinum Rhei. The powdered bark may be given in doses of ten to thirty grains.

**VITACEÆ**—The Vine Order.—Climbing shrubby plants, inhabiting the warm and tropical regions of the globe. Officinal plant: *Vitis vinifera.*

**Uvæ**—Raisins.—Officinal plant: *Vitis vinifera*, Linn.; the Grape Vine.—The ripe fruit, dried in the sun or with artificial heat; imported from Spain.

*Characters of Raisins.*—Fruits shrivelled and compressed, smooth, and free from sugary or saline incrustation, agreeably fragrant; pulp soft, very sweet.

*Therapeutics.*—Raisins are simply grapes dried either by exposure to the sun or by artificial heat, and are chiefly prepared in Spain, in Portugal, and in the Levant. The most esteemed kind is the Muscatel; Malaga, Sultana, and Smyrna raisins are also largely used. Corinthian raisins, commonly called *currants*, are the produce of a small grape which abounds in the Ionian Islands. The chief constituents of raisins are uncrystallizable *grape* sugar, acid tartrate of potash, malic and citric acids, mucilage, &c. Raisins are nutrient and demulcent, and are used as flavouring adjuncts to other medicines, such as the compound tincture of cardamoms and tincture of senna. Grapes are given to the sick and convalescent for the sake of their cooling and refreshing properties. Grapes have also been given in large quantities in what is termed, on the Continent, the "grape cure" of certain chronic maladies.

**LINACEÆ**—The Flax Order.—Herbs, or rarely shrubs, inhabiting the south of Europe and the north of Africa chiefly. The plants are remarkable for the mucilage and oil of their seeds, and also for the tenacity of their liber-fibres. They are generally emollient and demulcent, but some are bitter, purgative, or diuretic. Officinal plant: *Linum usitatissimum.*

**Lini Semina**—Linseed.—Officinal plant: *Linum usitatissimum*, Linn.; Linseed, Flax seed. Officinal parts:—1. *Lini semina*, the seeds; cultivated in Britain. 2. *Lini farina*, Linseed meal, the seeds ground and deprived of their oil by expression. 3. *Lini oleum*, Linseed oil, the oil expressed without heat from linseed.

*Botany.*—Annual. *Stem*, erect, slender, simple, smooth, one to two feet high. *Leaves*, alternate, simple, smooth, linear, lanceolate, sessile. *Flowers*, large, purplish-blue, in a corymbose panicle. *Capsules*, globular, each containing ten seeds. *Habitat*, indigenous, and largely cultivated.

*Characters of the Seed.*—Small, oval, pointed, flat, with acute edges, smooth, shining, brown externally, yellowish-white within, of a mucilaginous oily taste.

The seed consists of two parts: an outer covering, *testa*, or seed-coat, which contains 15 per cent. of mucilage; and an inner nucleus, which contains a fixed oil, 20 to 30 per cent.

INFUSUM LINI—INFUSION OF LINSEED.—*Take of linseed,* 160 *grains; fresh liquorice root, sliced,* 60 *grains; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for four hours, and strain. Dose, ad libitum.*

**Lini Oleum**—Linseed Oil.

*Characters.*—Viscid, yellow, with a faint odour and oleaginous taste.

**Lini Farina**—Linseed Meal.—The substance which remains in a flat, firmly coherent mass after the oil has been expressed from the kernels of the seeds, is called *oil-cake;* and this when powdered forms linseed meal.

CATAPLASMA LINI—LINSEED POULTICE.—*Take of linseed meal,* 4 *ounces; olive oil,* ½ *fluid ounce; boiling water,* 10 *fluid ounces. Mix the linseed meal gradually with the water, then add the oil, with constant stirring.* When powdered linseed from which the oil has not been expressed is used, the addition of olive oil is not required; but as the meal does not keep well with the oil in it, which soon turns rancid, the above formula is substituted for that of the London Pharmacopœia.

*Therapeutics.*—Linseed acts as a demulcent and emollient. *Linseed Tea,* made, like the officinal infusion, with the seeds, sweetened with honey, sugar candy, or liquorice root, and flavoured with lemon, is an agreeable pectoral drink, and when largely taken, acts somewhat as a soothing diuretic. The oil acts as an emollient, and with *Liquor Calcis* forms the celebrated *Carron Oil,* used as an application to burns. The oil acts also as a laxative, but is rarely used as such otherwise than as an enema. The poultice made with the meal is an excellent emollient application, useful in a variety of cases; the meal should be fresh, otherwise, especially if it contain rancid oil, it may irritate the skin and cause a disagreeable pustular eruption. The demulcent effects of linseed are valuable in bronchial affections, diarrhœa, dysentery, inflammation of the abdominal viscera, inflammatory affections of the genito-urinary passages.

**ZYGOPHYLLACEÆ**—The Bean-Caper and Guaiacum Order.—Herbs, shrubs, or trees, inhabiting generally the warm regions of the globe beyond the tropics. The plants possess stimulant, alterative, diaphoretic, or anthelmintic properties. Officinal plant: *Guaiacum officinale.*

**Guaiaci Lignum**—Guaiacum Wood—Lignum Vitæ.—The wood of Guaiacum officinale imported from St. Domingo and Jamaica; in the form of cleavings or raspings.

*Characters of the Wood.*—Guaiac wood, or *Lignum vitæ,* as it is also called, is extremely hard, heavy, and durable. It is imported in logs or billets of considerable size, and may be readily recognised by the peculiar arrangement of its fibres, and the distinction between the old and new wood. On examining a section of the wood, it is seen to consist of an outer portion of a pale-brown or yellow colour, encircling an inner and darker portion. The outer portion is the young wood, the alburnum or sap-wood, the inner being the duramen or heart-wood, in which is deposited the guaiac resin, whereby it is rendered dark greenish-brown in colour. The fibres of the wood cross each other obliquely. The shavings, turnings, or raspings of guaiac wood, which are commonly met with in the shops, are subject to admixture with those of other woods; but the true wood may be recognised by the above test, and also by its cross-grained character. It has an acrid, resinous, pungent taste, and an aromatic odour when rubbed or heated. Its specific gravity is 1·33, and therefore it sinks in water. Its chief and active constituent is a resin composed, however, of several substances (HADELICH, 1862), guaiaconic acid

($C_{19}H_{22}O_3$), 70 per cent., guaiaretic acid ($C_{20}H_{26}O_4$), 10 per cent., indifferent resin, 10 per cent., with gum, colouring matter, &c.

**Guaiaci Resina**—Guaiacum Resin, or Guaiacum.

*Characters.*—In large masses of a brownish or greenish-brown colour; fractured surface resinous, translucent at the edges. The resin of guaiacum may be obtained from the wood in one of four ways:—1. By natural exudation. 2. By incising the bark of the tree. 3. By boring holes lengthwise through the billets and logs of the stem and larger branches, then heating them in a fire, and collecting in a calabash the resin as it flows from the distant aperture. 4. By boiling the chips or raspings in salt and water (the boiling point of which is much higher than that of plain water), and skimming of the resin from the surface. Guaiac resin is met with in two forms: in tears and in masses. The tears are of round or oval form, and of different sizes; the masses, in which it is more commonly seen, are of considerable size. The former is known as *Guaiacum in Tears*, the latter as *Lump Guaiacum.* Guaiacum resin is semi-transparent and brittle, having a brilliant, shining, vitreous, and resinous fracture. Externally, it is covered with a grey dust, and its powder is also grey at first, but gradually assumes a greenish colour when exposed to the light. The outer surface is of a brownish-green or olive-green colour, but the recently fractured surface is reddish-brown, all parts becoming more or less green on exposure to light. When powdered or heated, it emits a balsamic odour, but otherwise it is nearly inodorous. When chewed, it softens in the mouth, and, though with but little perceptible taste, causes a burning sensation in the throat.

MISTURA GUAIACI—GUAIAC MIXTURE.—*Take of guaiacum resin, in powder, refined sugar, of each,* ½ *ounce; gum acacia, powdered,* ¼ *ounce; cinnamon water,* 1 *pint. Triturate the guaiacum with the sugar and the gum, adding gradually the cinnamon water. Dose,* ℥ss. *to* ℥ii.

TINCTURA GUAIACI AMMONIATA—AMMONIATED TINCTURE OF GUAIAC.—*Take of guaiacum resin, in powder,* 4 *ounces; aromatic spirit of ammonia, a sufficiency. Macerate the guaiacum in fifteen fluid ounces of the aromatic spirit of ammonia for seven days in a well-closed vessel, with occasional agitation, and filter; then add sufficient aromatic spirit of ammonia to make one pint. Dose,* ʒss. *to* ʒi.

*Dose.*—Of the resin, either in powder, bolus, electuary, or mucilage, ten to thirty grains.

*Therapeutics.*—Guaiacum acts as a stimulant, diaphoretic, and alterative, and it also increases the discharge of urine when its action upon the skin is not facilitated. In over-doses it produces burning in the throat, vomiting, purging, and febrile disturbance; and even in moderate doses its administration is occasionally followed by slight salivation or a cutaneous eruption. The cases in which it has been most useful are—chronic rheumatism, atonic gout, cynanche tonsillaris, syphilitic eruptions and pains, amenorrhœa, hyper-secretions of mucous membranes, &c. It is suitable in the cases of old and debilitated persons, and is contra-indicated in acute inflammatory states of the system.

**RUTACEÆ**—The Rue Order.—Trees, shrubs, or herbs inhabiting the southern part of the temperate zone. The plants have a peculiar penetrating odour and bitter taste, and are employed medicinally as antispasmodics, tonics, febrifuges, or diuretics. Officinal plants: *Barosma betulina, Barosma serratifolia, Barosma crenulata, Galipea Cusparia.*

**Oleum Rutæ**—English Oil of Rue.—*Ruta graveolens,* Common or Garden Rue. (Not officinal.) The oil distilled in England from the fresh leaves and the unripe fruit. Colour, pale yellow; odour, disagreeable; and bitter, acrid taste. *Dose,* 1 to 5 mins.

*Botany.*—A small, branching under-shrub, two to three feet high, with a strong, disagreeable odour. *Stem,* straight, dull-greenish, somewhat striated. *Leaves,* alternate, bluish-green; leaflets thickish, tapering towards the bases, dotted. *Flowers,* in a terminal corymb, yellow. *Fruit,* roundish, warty, four or five-lobed. *Seeds,* dotted. *Habitat,* South of Europe; cultivated in gardens. Every part of the plant has a strong, disagreeable odour, and a bitter, acrid taste.

*Therapeutics.*—Rue acts as a stimulating antispasmodic, and in over-doses as a narcotico-irritant. It is sometimes resorted to for the criminal purpose of procuring abortion, and was formerly much employed as an emmenagogue. Externally, the oil of rue acts as an irritant and vesicant. The preparations of rue have been recommended in amenorrhœa, chlorosis, hysteria, epilepsy, infantile convulsions, worms, &c.; but it is now chiefly used in the flatulent colic of children, administered either by the stomach or as an enema.

**Buchu Folia**—Buchu Leaves.—Officinal plants: 1. *Barosma betulina.* 2. *Barosma crenulata.* 3. *Barosma serratifolia.* Officinal part: The dried leaves; imported from the Cape of Good Hope.

*Characters of the Leaves.*—Smooth, marked with pellucid dots at the indentations and apex; having a powerful odour and a warm camphoraceous taste. 1. About three-quarters of an inch long, coriaceous, obovate, with a recurved truncated apex, and sharp cartilaginous spreading teeth. 2. About an inch long, oval-lanceolate, obtuse, minutely crenated, five-nerved. 3. From an inch to an inch and a-half long, linear-lanceolate, tapering at each end, sharply and finely serrated, three-nerved. The leaves vary in appearance according to the species from which they are obtained; they are generally smooth and shining, of a pale yellowish-green colour, have a strong disagreeable odour, and a warm and rather pungent taste. They are coriaceous, either serrated or crenated, and are studded, especially on the under-surface and near the margins, with glands containing an essential oil. These glands, or oil-vesicles, constitute the pellucid dots observed upon the leaves. The volatile oil of Buchu contained in these vesicles is of a yellowish-brown colour, and has the peculiar odour of the leaves. Besides this, the leaves contain also a bitter extractive, termed *Diosmin*, which is soluble in water, but neither in alcohol nor in ether; it is of a brownish-yellow colour, pungent odour, and bitter taste, and contains a small amount of camphor. Portions of the stalks, the flowers, and fruit of the plants are often intermingled with the leaves.

INFUSUM BUCHU—Infusion of Buchu.—*Take of Buchu, bruised,* ½ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* 1 *to* 6 *ounces, or more.*

TINCTURA BUCHU—Tincture of Buchu.—*Take of Buchu leaves, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the Buchu for forty-eight hours with fifteen ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒii.

*Therapeutics.*—Buchu acts as an aromatic stimulant, tonic, diaphoretic, and diuretic, operating beneficially upon the mucous membrane of the alimentary canal, and especially so upon the urinary passages. It is chiefly employed in chronic affections of the genito-urinary organs in which there is considerable mucous discharge, associated with more or less of general debility and dyspepsia. It should be continued for some time, and be given in large doses with alkalies, tincture of hyoscyamus, &c., according to circumstances.

CUSPARIÆ CORTEX — CUSPARIA BARK. — Officinal Plant: *Galipea Cusparia*, D.C.; Cusparia or Angustura Bark; from tropical South America

*Characters.*—In straight pieces, more or less incurved at the sides, from half-a-line to a line in thickness; epidermis mottled, brown, or yellowish-grey; inner surface yellowish-brown, flaky; breaks with a short fracture; the taste is bitter and slightly aromatic. The cut surface examined with a lens usually exhibits numerous white points or minute lines. The inner surface touched with nitric acid does not become blood-red. Dose of the powdered bark, 10 to 20 grains.

The bark, imported from South America, is met with either in flat pieces or in quills, from six to ten inches in length. Externally, it is covered with a soft, greyish-white epidermis; internally, it is brownish, and readily splits into laminæ. It has a bitter, aromatic, and somewhat acrid taste, and a strong peculiar odour. It breaks with a crisp resinous fracture. The bark contains, with other constituents, a volatile oil; also, a neutral bitter principle, termed *Cusparin* or *Angusturin*, and a little resin. Cusparia is not much subjected to adulteration, but occasionally the serious mistake has occurred of substituting the bark of the *Strychnos Nux-vomica.* Several cases of poisoning have occurred on the Continent from this error. So frequent were these casualties at one time in Austria, that the Government ordered all the Cusparia in the empire to be destroyed. The substituted bark received the name of *False* or *Spurious Angustura Bark.* The chief distinguishing characters between the two kinds of bark are—that the true bark occurs in quills, or in flattened pieces, almost straight, has a disagreeable odour, and a bitter and somewhat acrid persistent taste; when dry, it is readily broken or cut, and is light; when broken, it presents a dull and blackish surface, whilst externally, it is whitish or slightly yellow; its outer surface is not turned dark green, nor its inner surface blood-red by nitric acid; and finally, the inner surface of the bark is readily separable into laminæ. On the other hand, the bark of the *Strychnos Nux-vomica,* although also occurring in quills and in flattened pieces, is usually very much twisted; it has scarcely any odour, its bitter taste is intense and very persistent; it is heavy, compact, and neither easily cut nor broken; it has a resinous fracture; externally, it is sometimes whitish, but is usually marked either by spots, or by a complete layer of a spongy rust-coloured substance, which is turned dark green, or nearly black, by nitric acid. The inner surface is not separable into laminæ, but is rendered blood-red by nitric acid.

INFUSUM CUSPARIÆ—INFUSION OF CUSPARIA.—*Take of Cusparia, in coarse powder,* ½ *ounce; distilled water at* 120°, 10 *fluid ounces. Infuse in a covered vessel for two hours, and strain. Dose,* ℥ss *to* ℥ii.

*Therapeutics.*—Cusparia acts as a stimulant, aromatic, non-astringent tonic, and as a febrifuge. It is administered in atonic dyspepsia, in convalescence from acute diseases, in the latter stages of diarrhœa and dysentery, &c.; and in tropical South America it is highly esteemed as a febrifuge in intermittent and malignant bilious fevers. In large doses it causes nausea and purging.

**SIMARUBACEÆ**—The Quassia or Simaruba Order.—Shrubs or trees, inhabiting principally the tropical parts of India, America, and Africa. The plants are generally characterised by a bitter principle, and are employed as tonics and febrifuges. Officinal plant: *Picræna excelsa.*

QUASSIÆ LIGNUM—QUASSIA WOOD.—Officinal plant: *Picræna excelsa,* Lindl.; the Bitter Wood Tree, Jamaica Quassia. Offinal part: The wood from Jamaica.

*Characters of the Wood.*—Billets varying in size, seldom thicker than the thigh. Wood dense, tough, yellowish-white, intensely and purely bitter. Also chips of the same. Quassia contains a neutral bitter principle called *Quassite* or *Quassin,* which may be obtained in small white prismatic crystals; it is inodorous, but intensely bitter, scarcely soluble in water or in ether, but readily so in alcohol. The wood is tough, and therefore difficult to powder.

EXTRACTUM QUASSIÆ—EXTRACT OF QUASSIA.—*Take of Quassia wood, rasped,* 1 *pound; distilled water, a sufficiency. Macerate the Quassia with eight fluid ounces of the water for twelve hours; then pack in a percolator, and adding more of the water, allow the liquid slowly to pass until the Quassia is exhausted. Evaporate the liquor, filter it before it becomes too thick, and again evaporate by a water-bath, until the extract is of a suitable consistence for forming pills. Dose,* 2 *to* 5 gr.

INFUSUM QUASSIÆ—INFUSION OF QUASSIA.—*Take of Quassia wood, in chips,* 60 *grains; cold distilled water,* 10 *fluid ounces. Macerate in a covered vessel for half-an-hour, and strain. Dose, 1 to 2 oz.*

TINCTURA QUASSIÆ—Tincture of Quassia.—*Take of Quassia wood, in chips, ¾ ounce; proof spirit, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation; then strain, press, filter, and add sufficient proof spirit to make 1 pint. Dose, ʒss. to ʒii.*

*Therapeutics.*—Quassia acts as a pure bitter tonic and stomachic, devoid of aroma or astringency; also as an anthelmintic in thread worm. It is given in atonic dyspepsia, in convalescence from acute diseases, and from delirium tremens, and it has been also employed as a febrifuge in intermittent fever. As an anthelmintic it is best given as an enema. It is commonly used, in combination with alkalies, in the dyspepsia which follows free living, and is valuable as a vehicle for chalybeate medicines, with which, as it contains no tannin, it is compatible. Compared with the other simple bitters, Quassia is more powerful, and hence is not so well borne in the milder cases of dyspepsia, it also differs in being poisonous to some of the lower forms of animal life, and is anthelmintic, and probably in virtue of this action checks fermentation in dyspeptic derangements.

### Sub-class II.—Calycifloræ.

RHAMNACEÆ—the Buckthorn Order.—Shrubs or trees, generally distributed. The plants generally possess acrid and purgative properties. Officinal plant: *Rhamnus catharticus.*

RHAMNUS—Buckthorn.—*Rhamnus catharticus*, Purging Buckthorn. The plant is common in this country, in woods and hedgerows. It is a spreading shrub, from eight to ten feet high, the older branches forming thorny terminal spines; leaves, ovate, dentated; flowers, small, yellowish-green; fruit, a small round berry, black, when ripe, four celled. It flowers in May, and the fruit ripens in September. Seeds, four, hard, ovate, triangular, keeled. The fruit of *Rhamnus frangula*, which is sometimes mixed with that of *R. catharticus*, has only two seeds. The fruit contains a purgative principle, acetic acid, colouring matter, mucilage, &c., and has a disagreeable odour and taste. The purgative principle is called *Rhamnicine*, and, according to Winkler, is a glucoside convertible into *Cathartine* and grape sugar.

RHAMNI SUCCUS—Buckthorn Juice.—*The recently expressed juice of the ripe berries of common Buckthorn, Rhamnus catharticus*, Linn.

It is employed in the preparation of—

**SYRUPUS RHAMNI**—Syrup of Buckthorn.—*Take of Buckthorn juice, 4 pints; ginger, sliced, pimento, bruised, of each, ¾ ounce; refined sugar, 5 pounds, or a sufficiency; rectified spirit, 6 fluid ounces. Evaporate the juice to two pints and a-half, add the ginger and pimento, digest at a gentle heat for four hours, and strain. When cold add the spirit, let the mixture stand for two days, then decant off the clear liquor, and in this dissolve the sugar with a gentle heat, so as to make the specific gravity* 1·32. *Dose,* ʒss. *to* ʒii.

*Therapeutics.*—The syrup of buckthorn may be given in doses of one to two fluid drachms; the fresh juice may also be used in similar doses. Both the berries and their juice act as powerful hydragogue cathartics. The berries are apt to act violently, producing liquid evacuations, nausea, intense thirst, and tormina. The syrup is sometimes added as an adjuvant to other purgative medicines, and is also believed to act moderately as a diuretic. The preparations of buckthorn are seldom or never prescribed alone.

**ANACARDIACEÆ**—The Cashew or Sumach Order.—Trees or shrubs, chiefly inhabiting tropical America, Africa, and India. The plants abound in a milky, resinous, or somewhat gummy acrid and poisonous juice, which sometimes becomes black on drying. Officinal plant: *Pistacia Lentiscus.*

**Mastiche**—Mastich.—Officinal plant: *Pistacia Lentiscus,* Linn. Officinal part: A resinous exudation from the stem, obtained by incision; produced in the island of Scio.

*Characters.*—Small irregular yellowish tears, brittle, becoming soft and ductile when chewed, having a faint agreeable odour.

Mastich is obtained from the tree by incising the stem transversely. This is done in August or September. As the fluid escapes, it either hardens upon the tree (when it is called *Mastich in tears*), or falls upon the ground, and forms the common mastich. It is usually met with in roundish or flattened tears of a pale yellow colour, having a vitreous fracture, a fragrant agreeable odour, and a mild aromatic taste. It contains, besides other constituents, a volatile oil and two varieties of resin. Of the resins, one is soluble in alcohol, has the properties of an acid, combines with bases, and is called *Mastichic acid;* the other, called *Masticine,* is insoluble in alcohol, but is soluble in ether, and in the alcoholic solution of the mastichic acid resin; it is elastic and tenacious, and upon it depends the toughness of mastich.

*Therapeutics.*—Mastich acts like the ordinary coniferous turpentines, but is more agreeable to the taste. It is seldom used in medicine now, but, like the turpentines, it was formerly used to check chronic discharges from mucous membranes, especially the genito-urinary tract, as in leucorrhœa and chronic affections of the bladder and urethra, and also in debilitating discharges from the alimentary and broncho-pulmonary mucous membranes. It is sometimes used as a masticatory to impart fragrance to the breath, and is employed by dentists to fill the cavities of hollow teeth.

**AMYRIDACEÆ**—The Myrrh and Frankincense Order.—Trees or shrubs, natives of tropical India, Africa, and America. The plants abound in fragrant balsamic resin; some are poisonous, others bitter, purgative, and anthelmintic. Officinal plants: *Balsamodendron myrrha, Canarium commune.*

**Myrrha**—Myrrh.—Officinal plant: *Balsamodendron myrrha;* the Myrrh Tree. Officinal part: A gum-resinous exudation from the stem; collected in Arabia Felix and Abyssinia.

*Characters.*—In irregular-shaped tears or masses, varying much in size, somewhat translucent, of a reddish-yellow or reddish-brown colour, fractured surface irregular and somewhat oily; odour agreeable and aromatic; taste acrid and bitter.

Myrrh contains, besides other constituents, a volatile oil, resin, and gum. The volatile oil is thin, but of high specific gravity; it is at first colourless, but gradually assumes a yellow colour. It is soluble in alcohol, in ether, and in the fixed oils, and has the odour and taste of myrrh. Its solution is turned red by sulphuric, nitric, and hydrochloric acids. The resin is of two kinds, *soft* and *hard.* The gum also is of two varieties, the one soluble, the other insoluble in water. Myrrh is but partially soluble in water, but forms a white emulsion with it, the resin being suspended by the soluble gum. Rectified spirit takes up the volatile oil and the resin.

TINCTURA MYRRHÆ—TINCTURE OF MYRRH.—*Take of myrrh, in coarse powder, 2½ ounces; rectified spirit, 1 pint. Macerate the myrrh for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose,* ʒss. *to* ʒii.

*Therapeutics.*—Myrrh, in small doses, acts as a stimulant and tonic, giving an impetus to the digestive organs, and an increase of muscular power to the intestinal canal; it causes, also, a diminution of the exhalations from mucous membranes, and hence gives rise to slight constipation. In large doses its stimulating effects are more fully developed, and there is a tendency to acridity. Topically, myrrh acts mildly as an astringent. It is rarely given alone internally, but in combination with other appropriate remedies. Its use is indicated where there is debility of the system and general relaxation of the tissues, and it is contra-indicated in inflammatory cases and in plethoric habits. It is useful in cases of chronic discharges from any of the mucous membranes. It has no true emmenagogue properties, as it has been erroneously stated to have. Topically, it is useful as a wash for the gums and throat, and as an application to foul ulcers.

**Elemi**—Elemi.—Botanical source undetermined; probably from *Canarium commune*, Linn. Officinal part: A concrete, resinous exudation, chiefly imported from Manilla.

*Characters.*—A soft unctuous adhesive mass, becoming harder and more resinous by age; of a yellowish-white colour, with a rather fragrant fennel-like odour; almost entirely soluble in rectified spirit.

UNGUENTUM ELEMI—OINTMENT OF ELEMI.—*Take of elemi, ¼ ounce; simple ointment, 1 ounce. Melt, strain through flannel, and stir constantly until the ointment solidifies.*

*Therapeutics.*—Elemi is a stimulant, and acts like the terebinthinates, but is never employed internally. The ointment is used as a stimulant application to chronic indolent sores, and also to promote the discharge caused by setons and issues.

**LEGUMINOSÆ.**—Herbs, shrubs, or trees, extensively distributed, having representatives in almost every part of the world, but they are most abundant in warm regions, and gradually diminish on approaching the poles. The order has been divided into three sub-orders—*Papilionaceæ*, *Cæsalpinieæ*, and *Mimoseæ*. The properties and uses of the plants of this order are very variable. Officinal plants:—1. Of the sub-order, *Papilionaceæ*, *Myroxylon Pereiræ*, and *M. Toluiferum*, *Pterocarpus santalinus* and *P. Marsupium*, *Sarothamnus scoparius*, *Glycyrrhiza glabra*, *Astragalus verus*, and *Physostigma Venenosum.* 2. Of the sub-order, *Cæsalpinieæ*, *Cassia lanceolata*, *C. obovata*, *C. elongata*, *Cassia Fistula*, *Hæmatoxylon campechianum*, *Tamarindus indica*, *Copaifera multijuga*, and other species. 3. Of the sub-order, *Mimoseæ*, the Gum Arabic section, one or more undetermined species of *Acacia.*

*Sub-order* 1. *Papilionaceæ.*

***Balsamum* Peruvianum**—BALSAM OF PERU.—A balsam obtained from Myroxylon Pereiræ. It exudes from the trunk of the tree after the bark has been scorched and removed. From Salvador, in Central America.

*Characters of the Balsam.*—A reddish-brown or nearly black liquid, translucent in thin films; having the consistence of syrup, a balsamic odour, and an acrid slightly bitter taste; soluble in five parts of rectified spirit.

*Dose.*—20 mins. to ʒi. made into an emulsion with mucilage, or yolk of egg.

**Balsamum Tolutanum**—Balsam of Tolu.—Officinal plant: *Myroxylon Toluiferum;* Balsam of Tolu Tree. Officinal part: A balsam which exudes from the trunk of the tree after incisions have been made into the bark; from the mountains of Tolu in New Granada.

*Characters.*—A soft and tenacious solid, with a fragrant balsamic odour, soluble in rectified spirit.

*Composition.*—These are true balsams, *i.e.* oleo-resins, which yield benzoic or cinnamic acid. Balsam of Peru is composed of volatile oil, 60 to 70 per cent.; resin, 32 per cent.; and cinnamic acid, 6 per cent.

SYRUPUS TOLUTANUS—Syrup of Tolu.—*Take of Balsam of Tolu, 1¼ ounce; refined sugar, 2 pounds; distilled water, 1 pint, or a sufficiency. Boil the balsam in the water for half-an-hour in a lightly-covered vessel, stirring occasionally. Then remove from the fire, and add distilled water, if necessary, so that the liquid shall measure sixteen ounces. Filter the solution when cold, add the sugar, and dissolve with the aid of a steam or water bath. The product should weigh three pounds, and should have the specific gravity* 1·330. *Dose,* ʒi. *to* ʒii.

TINCTURA TOLUTANA—Tincture of Tolu.—*Take of Balsam of Tolu, 2½ ounces; rectified spirit, a sufficiency. Macerate the Balsam of Tolu in fifteen fluid ounces of the spirit, in a closed vessel, with occasional agitation, for six hours, or until the balsam is dissolved, then filter, and add sufficient rectified spirit to make one pint. Dose,* 20 *mins. to* ʒii.

*Therapeutics.*—The Balsams of Peru and Tolu act as stimulants and expectorants when given internally, and as stimulants and detergents when applied to wounds and sores externally. The circulation is increased in activity, and the secretion of the bronchial mucous membrane is more readily discharged under their influence. They appear to have a distinct predilection for the mucous membrane of the air-passages, as copaiva has for the genito-urinary tract. They are employed chiefly in old standing affections of the bronchial mucous membrane,—as in chronic catarrhs, habitual winter coughs, &c., especially when there is torpor or debility of constitution. In consequence of their stimulant action they are contra-indicated in acute inflammatory affections. Formerly they were administered in phthisis, with a view of healing the pulmonary tissue in the same way as they act when applied to wounds externally; but this use has been abandoned. They are available in some chronic asthmatic cases. They, and their officinal preparations, may be employed as agreeable adjuvants to other stimulating expectorants, but are seldom given alone. Externally, Balsam of Peru is employed as a stimulant and detergent application in alopœcia, to indolent and foul ulcers, bed sores, chapped nipples, &c.

**Pterocarpi Lignum**—Red Sandal-Wood.—Officinal plant: *Pterocarpus santalinus*, Linn.; Red Sandal, or Red Sanders Wood Tree. Officinal part: The wood; from Coromandel and Ceylon.

*Characters.*—Dense heavy billets, outwardly dark brown, internally variegated with dark and lighter red rings, if cut transversely. Powder, blood-red, of a faint peculiar odour, and an obscurely astringent taste. Also chips of the same. The wood contains a peculiar crystallizable colouring principle, termed Santaline or Santalic acid. Alcohol, ether, and alkaline solutions abstract the colouring matter. The only medicinal use of the wood is to impart colour to the compound tincture of lavender, and through it to the liquor arsenicalis.

**Kino**—Kino.—Officinal plant: *Pterocarpus Marsupium*, D.C.; the Indian Kino Tree. Officinal part: The juice obtained from incisions in the trunk, inspissated; imported from Malabar.

*Characters.*—In small, angular, brittle, glistening, reddish-black fragments, translucent and ruby-red on the edges, inodorous, very astringent. When chewed, it tinges the saliva blood-red. It is composed of Kino tannic acid, 75 per cent., $C_{18}H_{18}O_8$; Kino red; gum, &c.

TINCTURA KINO—TINCTURE OF KINO.—*Take of kino, in coarse powder, 2 ounces; rectified spirit, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation, filter, and add sufficient rectified spirit to make one pint. Dose, ʒss. to ʒi.*

PULVIS KINO COMPOSITUS—COMPOUND POWDER OF KINO.—*Pulvis Kino cum Opio*, 1864. *Take of kino, in powder, 3¾ ounces; opium, in powder, ¼ ounce; cinnamon bark, in powder, 1* *ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally rub it lightly in a mortar. Keep it in a stoppered bottle. It contains* 1 *grain of opium in* 20 *grains. Dose,* 5 *to* 30 *grains, according to circumstances.*

*Therapeutics.*—Kino is a less powerful astringent than catechu, although it contains a larger quantity of tannic acid, because kino tannic acid is less soluble than that which is present in catechu, but resembles it in its medicinal properties. It is used as a pure astringent in chronic diarrhœa and dysentery, in combination with chalk and opiates. It is also employed for the sake of its astringency in chronic mucous discharges, and also in passive hemorrhages. It has been found serviceable in pyrosis, and in some forms of dyspepsia. As a topical astringent it is used as a gargle or injection, and also as an application to flabby ulcers. It is given in cases associated with general debility, and is contra-indicated in inflammatory states.

**Scoparii Cacumina.**—Broom Tops.—Officinal plant: *Sarothamnus scoparius,* Wimmer; Common Broom. Officinal part: The tops, fresh and dried; from indigenous plants.

*Botany.*—A shrub, from three to eight feet high, with angular, unarmed branches. *Leaves,* ternate at the lower and simple at the upper part; leaflets oblong. *Flowers,* large, yellow, axillary, solitary, stalked, papilionaceous. *Legume,* flat, compressed, dark-brown, containing about fifteen seeds. *Habitat,* indigenous, dry, sandy places throughout Europe. *Flowering time,* June.

*Characters of Broom Tops.*—Straight, angular, dark-green, smooth, tough twigs, of a bitter, nauseous taste, and of a peculiar odour when bruised.

Broom tops contain, besides other constituents, two peculiar substances, obtained by Dr. Stenhouse—one, termed *Scoparin* ($C_{21}H_{22}O_{10}$), a neutral principle, which may be separated in yellow stellate crystals; the other a volatile liquid alkaloid, called *Spartia* ($C_{15}H_{26}N_2$), which is at first colourless, but assumes a brownish colour on exposure to light. Scoparian acts as a diuretic in repeated doses of about five grains, and does not produce injurious effects; but spartia produces powerful narcotic effects in small doses on the lower animals, but as it is sparingly soluble in water and spirit, it is doubtful if it plays any part in the medicinal action of broom tops.

DECOCTUM SCOPARII—DECOCTION OF BROOM.—*Take of broom tops, dried,* 1 *ounce; distilled water,* 1 *pint. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the* *contents of the strainer as will make the strained product measure a pint. Dose,* ℥i. *to* ℥iv., *or more.*

SUCCUS SCOPARII—Juice of Broom.—*Take of fresh broom tops,* 7 *pounds; rectified spirit, a sufficiency. Bruise the broom tops in a stone mortar, press out the juice, and to every three measures of juice add one of the spirit. Set aside for seven days, and filter. Keep in a cool place. Dose,* ʒi. *to* ʒii.

*Therapeutics.*—Broom acts as a trustworthy diuretic, its action being consistent and uniform; it is a stimulant diuretic, acting directly on the secretory structure of the kidneys, and is therefore contra-indicated in acute inflammation of these organs. Its officinal preparations are used as vehicles for, or as adjuncts to enhance the activity of other remedies of a similar class. In large doses they act as emetics and purgatives. They are usually administered in dropsies, especially those of cardiac origin, with tincture of digitalis, &c.

**Glycyrrhizæ Radix**—Liquorice Root.—Officinal plant: *Glycyrrhiza glabra,* Linn.; Common Liquorice. Officinal part: The root or underground stem, fresh and dried; cultivated in England.

*Botany.*—Root, perennial, running to a considerable distance. *Stem,* herbaceous, erect, smooth, four to five feet high. *Leaves,* impari-pinnate; leaflets about thirteen, oval, slightly emarginate, viscid underneath. *Flowers,* in axillary racemes, papilionaceous, distant, lilac, bluish or purplish in colour. *Legume,* compressed, smooth, three to four-seeded. *Habitat,* south of Europe; cultivated at Mitcham, in Surrey.

*Characters of Liquorice Root.*—In long cylindrical branched pieces, an inch or less in diameter, tough and pliable; of a greyish-brown colour externally, yellow internally, without odour, of a sweet, mucilaginous, and slightly acrid taste. Digested with water, it yields a solution which gives a precipitate with diluted sulphuric acid.

Its chief constituents are *Glycyrrhizin,* which is a kind of uncrystallizable sugar, incapable of undergoing the vinous fermentation; it has the sweet taste of the root, and is soluble both in water and alcohol; and a *resinous oil,* which imparts to the root a slightly acrid taste.

EXTRACTUM GLYCYRRHIZÆ LIQUIDUM—Liquid Extract of Liquorice. *Dose,* ʒi.

Preparation.—*Take of liquorice root, in coarse powder,* 1 *pound; distilled water,* 4 *pints. Macerate the liquorice root with two pints of the water for twelve hours, strain, and press; again macerate the pressed* *marc with the remainder of the water for six hours, strain, and press. Mix the strained liquors, heat them to* 212°, *and strain through flannel; then evaporate by a water-bath until it has acquired, when cold, a specific gravity of* 1·160; *add to this one-eighth of its volume of rectified spirit, let the mixture stand for twelve hours, and filter.*

EXTRACTUM GLYCYRRHIZÆ—EXTRACT OF LIQUORICE.—*Take of liquorice root, in coarse powder,* 1 *pound; distilled water,* 4 *pints. Macerate the liquorice root with two pints of the water for twelve hours, strain, and press; again macerate the pressed marc with the remainder of the water for six hours, strain, and press. Mix the strained liquors, heat them to* 212°, *and strain through flannel. Then evaporate by a water-bath until the extract is of a suitable consistence for forming pills. Dose,* 10 *to* 30 *grs.*

PULVIS GLYCYRRHIZÆ COMPOSITUS—COMPOUND POWDER OF LIQUORICE.—*Take of senna, in fine powder, liquorice root, in fine powder, of each,* 2 *ounces; refined sugar, in powder,* 6 *ounces. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Dose,* 30 *to* 60 *grs.*

*Therapeutics.*—Liquorice preparations act as emollients and demulcents, and are given in coughs and bronchial affections, as well as for the purpose of flavouring other medicines. Compound Powder of Liquorice, which, as well as the liquid extract, is now made officinal, has been adopted with alterations from the Prussian Pharmacopœia. Indeed, the Prussian preparation had of late years come into very general use in this country, as a mild and agreeable aromatic purgative, suitable for delicate females, and especially so if piles coexisted with the constipation; also for old people, in convalescence from acute disease, and in pregnancy. Properly speaking, however, it ought to be classed with the preparation of senna, as its action is entirely due to the senna which it contains. The Prussian preparation contains, in addition to the ingredients included in the compound powder of the British Pharmacopœia, one pint each of purified sulphur and of bruised fennel seeds, the one of which increases its laxative properties, and the other communicates to it aromatic powers. It is difficult to judge on what grounds these substances should have been excluded from the British Codex, as the Prussian preparation gains thereby positive therapeutical superiority over the British one.

Prescribers will require to note also which preparation is meant, to prevent mistakes in dispensing calculated to arise from the confusion of names, by adding the letters B.P. or G.P. The liquid extract is used as a flavouring adjunct to other medicines. Both the liquid and the ordinary extracts are seldom or never prescribed by themselves. The decorticated root, powdered, is used chiefly to cover pills, and prevent them from adhering to one another.

**Tragacantha**—Tragacanth.—Officinal plant: *Astragalus verus*, Olivier, and possibly other species. Officinal part: A gummy exudation from the stem, collected in Asia Minor.

*Characters.*—White or yellowish, in broad, shell-like, slightly-curved plates, tough and elastic, but rendered more pulverisable by a heat of 120° Fahr.; very sparingly soluble in cold water, but swelling into a gelatinous mass, which is tinged violet by tincture of iodine.

The chief constituents of tragacanth are *Tragacanthin* (adragantine or arabin), which is a soluble gum; and *Bassorin*, a gum which absorbs water and swells up, but is insoluble in it, whether hot or cold. It is soluble in alcohol. Tragacanth also contains a little starch.

PULVIS TRAGACANTHÆ COMPOSITUS—COMPOUND POWDER OF TRAGACANTH.—*Take of tragacanth, in powder, gum acacia, in powder, starch, in powder, of each,* 1 *ounce; refined sugar, in powder,* 3 *ounces. Rub them well together. Dose,* 20 *to* 60 *grs.*

MUCILAGO TRAGACANTHÆ—MUCILAGE OF TRAGACANTH.—*Take of tragacanth, in powder,* 60 *grains; distilled water,* 10 *fluid ounces. To the water, contained in a pint bottle, add the tragacanth; agitate briskly for a few minutes, and again at short intervals, until the tragacanth is perfectly diffused, and, finally, has formed a mucilage.*

*Therapeutics.*—Tragacanth and its preparations act as emollients and demulcents. They are chiefly used as vehicles for other medicines—the mucilage to suspend insoluble substances in mixtures, the compound powder as a vehicle for heavy active substances, such as calomel; but they may be given alone as demulcents and emollients in irritant poisoning, &c. The mucilage is used in the preparation of lozenges. Tragacanth makes a much thicker mucilage than gum arabic, and for most purposes gum arabic is preferable.

**Indigo**—Indigo ($C_8H_5NO$), a blue pigment prepared from various species of *Indigofera*, Linn. Indigo is placed in Appendix I. of the Pharmacopœia, and is used in the preparation of the test solution of sulphate of indigo.

*Therapeutics.*—Indigo has been used medicinally. Its physiological action, when fully developed, is attended more or less with constriction and heat of the fauces, a metallic taste, nausea, vomiting, diarrhœa (with bluish or blackish liquid stools); the urine assumes a dark brown or violet colour, and, after long use, twitching of the muscles is observed. It has been chiefly recommended as a nervine tonic in spasmodic diseases, convulsions of children, epilepsy, chorea, hysteria, &c. It may be given, in doses of a few grains up to several drachms, as an electuary.

PHYSOSTIGMATIS FABA—CALABAR BEAN.—Eséré-Nut, or Ordeal-bean of Old Calabar; the seed of *Physostigma venenosum*, Balfour. Imported from Western Africa.

*Characters of the Seeds.*—About the size of a very large horse-bean, with a very firm, hard, brittle, shining integument of a brownish-red, pale-chocolate, or ash-grey colour. Irregularly kidney-shaped, with two flat sides, and a furrow running longitudinally along its convex margin, ending in an aperture near one end of the seed. Within the shell is a kernel consisting of two cotyledons, weighing on an average about forty-six grains, hard, white, and pulverisable, of a taste like that of the ordinary edible leguminous seeds, without bitterness, acrimony, or aromatic flavour. It yields its virtues to alcohol and imperfectly to water.

*Composition.*—The active principle is an alkaloid Physostigmia or Eseria ($C_{30}H_{21}N_3O_4$), discovered by Jobst and Hesse in 1863. It is amorphous, no colour or taste, and is contained chiefly in the cotyledons, although Dr. Fraser states that the shells are not devoid of activity. A watery solution of it or its salts containing potash, soda, or lime on exposure to the air becomes red, then yellow, green, or blue from decomposition.

EXTRACTUM PHYSOSTIGMATIS—EXTRACT OF CALABAR BEAN.—*Take of Calabar bean, in coarse powder, 1 pound; rectified spirit, 4 pints. Macerate the bean for forty-eight hours with one pint of the spirit in a close vessel, agitating occasionally, then transfer to a percolator, and when the fluid ceases to pass, add the remainder of the spirit, so that it may slowly percolate through the powder. Subject the residue of the bean to pressure, adding the pressed liquid to the product of the percolation; filter, distil off most of the spirit, and evaporate what is left in the retort by a water-bath to the consistence of a soft extract. Dose, $\frac{1}{16}$ to $\frac{1}{4}$ grain.*

*Therapeutics.*—Professor Christison was the first to give an account of the physiological effects of the Calabar bean in the human subject, and he bought his experience by an experiment upon himself. Having swallowed twelve grains of the bean on getting up in the morning, he describes the following consequences :—"A slight giddiness, which occurred in fifteen minutes, was ascribed to the force of the imagination; and I proceeded to take a warm shower-bath, which process, with the subsequent scrubbing, might take up five or six minutes more. The giddiness was then very decided, and was attended with the peculiar indescribable torpidity over the whole frame which attends the action of opium and Indian hemp in medicinal doses. Being now quite satisfied that I had got hold of a very energetic poison, I took immediate means for getting quit of it, by swallowing the shaving water I had just been using, by which the stomach was effectually emptied. Nevertheless, I presently became so giddy, weak, and faint, that I was glad to lie down supine in bed. The faintness continuing great, but without any uneasy feeling, I rung for my son, told him distinctly my state, the cause, and my remedy, that I had no feeling of alarm, but that for his satisfaction he had better send for a medical friend. Dr. Simpson, who was the nearest, reached me in a few minutes, within forty minutes after I ate the seed, and found me very prostrate and pale, the heart and pulse extremely feeble, and tumultuously irregular: my condition altogether very like that induced by profuse flooding after delivery, but my mental faculties quite entire, and my only sensation that of extreme faintness, not, however, unpleasant. Dr. Simpson judged it right to proceed at once for Dr. Douglas Maclagan as a toxicological authority, and returned with him in a very few minutes. In his absence, feeling sick, I tried to raise myself on my elbow to vomit, but failed; I made a second more vigorous effort, but scarcely moved. At once it struck me, 'This is not debility, but volition is inoperative.' In a third effort, I was more nearly successful; and in the fourth, a resolute exercise of the will, I did succeed. But I could not vomit. The abdominal muscles acted too feebly, nor were they much aided by a voluntary effort to make them act. I then gave up the attempt, and fell back, comforting myself with the reflection that vomiting was unnecessary, as the stomach had been thoroughly cleared. At the same time the sickness ceased, and it never returned. There were now slight twitches across the pectoral muscles. I also felt a sluggishness of articulation; and to avoid any show of this, made a strong effort of the will to speak slowly and firmly, through fear of alarming my son, who was alone with me. Dr. Maclagan, on his arrival, thought my state very like the effects of an over-dose of aconite. Like Dr. Simpson, he found the pulse and action of the heart very feeble, frequent, and most irregular, the countenance very *pale, the* prostration great, the mental faculties unimpaired, unless perhaps it might be that I felt no alarm, where my friends saw some reason for it. I had, in fact, no uneasy feeling of any kind, no numbness, no prickling, not even any sense of suffering from the great faintness of the heart's action; and as for alarm, though conscious I had got more than I had counted on, I could also calculate, that if six grains [which Professor Christison had taken after supper the previous night, and were not removed by vomiting] had no effect [or at most, a certain pleasant feeling of slight numbness in the limbs, like that which precedes the sleep caused by opium or morphia], twelve could not be deadly, when the stomach had been so well cleared out. Presently my limbs became chill, with a vague feeling of discomfort. But warmth to the feet relieved this, and a sinapism over the whole abdomen was peculiarly grateful when it began to act. Soon afterwards the pulse improved in volume, but not in regularity. I was now able to turn in bed, and happening to get on the left side, my attention was for the first time directed to the extremely tumultuous action of the heart, which compelled me to turn again on the back, to escape the strange sensation. Two hours after the poison was swallowed, I became drowsy, and slept for two hours more; but the mind was so active all the while, that I was not conscious of having been asleep. On awaking, the tumultuous action of the heart continued. In an hour more, however, I took a cup of strong coffee, after which I speedily felt an indefinable change within me; and on examining the condition of the heart, I found it had become perfectly and permanently regular. For the rest of the forenoon, I felt too weak to care to leave my bed; and on getting up after a tolerable dinner, I was so giddy as to be glad to betake myself to the sofa for the evening. Next morning, after a sound sleep, I was quite well."

But to Dr. Thos. R. Fraser is due the credit of investigating most thoroughly the properties of the Calabar bean.

Dr. Fraser's principal results regarding the nature of the physiological action of the bean may be thus summarised:—

1. The Calabar bean, when acting as a poison, may produce death either, *1st*, by paralysis of respiration—*Asphyxia;* or, *2nd*, by first diminishing the frequency of the heart's action, and then, finally, stopping its contractions—*Syncope.*

2. The paralysis resulting seems to be due to an action upon the spinal cord as a *reflex centre*, and not to be owing to any effect either upon the spinal nerves or the cerebrum.

3. Its cardiac effect is most probably due, not to any increase of the inhibitory power of the vagus, but to its paralysing the exciting ganglia of the heart.

4. Physostigma, however, after a time paralyses the motor or efferent spinal nerves, its action in so doing commencing in their peripheral extremities, like conium and curare. It does not seem to exert any paralytic action upon afferent or sensory nerves.

5. The effect on the smaller blood-vessels is, first, contraction, and afterwards dilation. Large doses at once arrest cardiac movements; smaller doses make them grow less quickly feeble. Immediately after the administration of the poison, there usually occurs a slight fall in the arterial tension. This is followed by a distinct rise in both arterial and venous pressure, but subsequently a rapid diminution of pressure in both arterial and venous systems supervenes.

6. The pupil is found alternately to dilate and contract. At the moment of death it is found contracted, but immediately afterwards it is found to dilate.

Locally, Calabar bean destroys the contractility of striped and non-striped muscles. It paralyses first afferent then efferent nerves. Applied to the eyeball, it produces a somewhat painful sensation of tension in the ciliary region, contraction of the pupil, myopia and astigmatism, with frequently congestion of the conjunctival vessels, pain in the supraorbital region, and twitches of the orbicularis palpebrarum muscle.

Its physiological action, especially on the spinal cord, has suggested its use in spasmodic spinal affections, as in tetanus, strychnia poisoning, and chorea; but in tetanus alone has its employment been followed by any satisfactory result. The mode of administration must be attended to. Fraser recommends to commence with subcutaneous injection until the system is decidedly affected, then give the remedy by the mouth in a dose three times larger than that given subcutaneously. For an adult, one grain of the extract by the mouth; or, one-third of a grain subcutaneously, repeated in two hours; and the after dose, modified according to results. It has also been given in chronic constipation.

But it is chiefly used as a topical agent in ophthalmic surgery. In 1856, Van Hassalt found contraction of the pupil to follow the internal administration of the bean; whilst Dr. Fraser, in 1862, showed that its local application was sufficient to induce this condition. In 1863, Dr. Argyll Robertson further pointed out that the local application of this remedy induced spasm of the accommodation of the eye, as well as contraction of the pupil, and was capable of counteracting or modifying the dilation of pupil and paralysis of accommodation, resulting from the application of belladonna or atropine to the eye. This contraction of the pupil or myosis follows the internal administration of the bean, and also when it is applied directly to the eye, only if applied to one eye the pupil of the other eye is unaffected; hence it follows that the influence of Calabar bean is exerted directly upon the peripheral nerves of the iris, whether the drug is placed on the eye from the outside, or be carried to it by the general circulation. How does it act? This myosis may be caused either by paralysis of the sympathetic; by stimulation of the oculo-motor nerve, or by acting on both. In all probability it is due to its depressant action on the spinal system paralysing the sympathetic whence the radiating fibres of the iris are supplied with nerves, the circular muscle of the iris continuing to contract, its action being unopposed, having cerebral fibres distributed to it.

The following are the effects observed upon the application of a drop of a moderately strong solution of the spirituous extract of the Calabar bean to the conjunctiva of the eye:—In the course of about ten minutes the accommodation of the eye becomes affected; objects beyond a few inches from the eye appear dim, enlarged, and closer to the eye, while upon the use of a suitable concave glass these symptoms disappear,—in fact, a condition of short-sightedness results. At the same time, a sensation of straining is felt in the eye, similar to that experienced after a prolonged near inspection of fine objects. After a short interval the pupil becomes contracted, and this may reach to such an extent, that the pupil does not measure above one-third of a line in diameter. As the effects pass off, the affection of the accommodation gradually returns to its normal state, and, secondarily, the pupil dilates, and in the course of about twenty-four hours the eye has returned to its natural condition.

The local employment of this agent is beneficial—*1st*, In cases of paralysis of the circular fibres of the iris and of the accommodation, such as are apt to follow exposure to cold, or to occur in the course of diphtheria, continued fever, or other debilitating diseases; *2nd*, To counteract the effects of atropine or belladonna on the eye; *3rd*, To diminish the amount of light admitted to the eye in cases of acute inflammation of choroid or retina; and *4th*, In cases of penetrating ulcers or wounds at the peripheral part of the cornea, with the view of preventing or reducing prolapse of the iris.

*Dose.*—For local application, a solution of the spirituous extract of the bean in glycerine, of such a strength that one minim contains the active ingredients of four grains of the bean, is that most generally employed. A preparation termed *Calabarised gelatine* is a very convenient and portable form. It consists of thin sheets of gelatine saturated with a spirituous solution of the bean, and marked out into small squares, or cut into minute discs, each of which is sufficient for a single application. They are to be applied, by means of a fine moistened camel's-hair pencil, to the conjunctiva, where they are dissolved by the tears, and produce their due effect.

*Antidotes.*—Emetics to empty the stomach thoroughly and promptly; followed by strong coffee and diffusible stimulants. From certain experiments made by Dr. Fraser, he has been led to believe that atropia is a physiological antidote against poisoning with Calabar bean, which it is to some extent, as atropia increases the action of the heart's arterial tension and respiratory movements, while Calabar bean diminishes them.

*Sub-order* 2. *Cæsalpinieæ.*

**Senna**—1. SENNA ALEXANDRINA, Alexandrian Senna.—Officinal plants: *Cassia lanceolata; Cassia obovata.* Officinal part: The leaflets, imported from Alexandria, carefully freed from the flowers, pods, and leaf-stalks of the same, and from the leaves, flowers, and fruit of *Solenostemma Argel.*

2. SENNA INDICA—Tinnivelly Senna.—Officinal plant: *Cassia elongata.* Officinal part: The leaves from plants cultivated in Southern India.

*Characters of Alexandrian Senna.*—Lanceolate or obovate leaflets, about an inch long, unequally oblique at the base, brittle, greyish-green, of a faint peculiar odour, and mucilaginous sweetish taste. Alexandrian senna, according to the B. P., is said to be partly composed of the leaflets of C. obovata—formerly it was—but as it is now thought to yield an inferior senna it is little collected, and the Alexandrian senna contains few if any leaflets, but if present they are readily recognised by their obovate outline.

The unequally oblique base, and freedom from bitterness, distinguish the senna from the argel leaves, which are also thicker and stiffer.

*Characters of Tinnivelly Senna.*—About two inches long, lanceolate, acute, unequally oblique at the base, flexible, entire green, without any admixture; odour and taste those of Alexandrian senna.

But various other species possess purgative properties, and are on that account more or less used in the countries where they grow. Three kinds are principally distinguished in English commerce—Alexandrian, Tinnivelly, and Bombay (E. Indian or Arabian), the *Tinnivelly* being now perhaps in most demand.

Senna consists chiefly of cathartic acid, yellow colouring matter, volatile oil, fixed oil, albumen, mucus, malic acid, malate, and tartrate of lime, acetate of potash, mineral salts, lignin, &c. The odorous principle of senna may be obtained by distilling the leaves with water; it has a disagreeable odour and taste. Cathartic acid is now known to be the purgative element in senna. It is a glycoside, and is stated to have the formula $C_{180}H_{192}N_4SO_2$. It is extremely unstable. It is insoluble in water, strong alcohol, and ether, but its alkaline and earthly salts are readily soluble. The cathartate of ammonia acts as a slow but certain purgative, in doses of 3¾ grains, occasioning, at the same time, considerable griping. In doses of 7½ grains it acts as a violent purge, producing much griping and sickness.

CONFECTIO SENNÆ—Confection of Senna—(Lenitive Electuary).—*Take of senna, in fine powder,* 7 *ounces; coriander fruit, in fine powder,* 3 *ounces; figs,* 12 *ounces; tamarind,* 9 *ounces; cassia pulp,* 9 *ounces; prunes,* 6 *ounces; extract of liquorice,* ¾ *ounce; refined sugar,* 30 *ounces; distilled water, a sufficiency. Boil the figs and prunes gently with twenty-four ounces of distilled water in a covered vessel for four hours, then, having added more distilled water to make up the quantity to its original volume, mix the tamarind and cassia pulp, digest for two hours, and rub the softened pulp of the fruits through a hair sieve, rejecting the seeds and other hard parts. To the pulped product add the sugar and extract of liquorice, and dissolve them with a gentle heat; while the mixture is still warm, add to it gradually the mixed senna and coriander powders, and mix the whole thoroughly, making the weight of the resulting confection seventy-five ounces, either by evaporation or by the addition of more distilled water. Dose,* 60 *grs. to* ℥ss.

INFUSUM SENNÆ—Infusion of Senna.—*Take of senna,* 1 *ounce; ginger, sliced,* 30 *grains; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* ℥i. *to* ℥ii.

SYRUPUS SENNÆ—Syrup of Senna.—*Take of senna, broken small,* 16 *ounces; oil of coriander,* 3 *minims; refined sugar,* 24 *ounces; distilled water,* 5 *pints, or a sufficiency; rectified spirit,* 2 *fluid ounces. Digest the senna in seventy ounces of the water for twenty-four hours at a temperature of* 120°*; press out the liquor and strain it. Digest the marc in thirty ounces of the water for six hours at the same temperature; again press out the liquor and strain it. Evaporate the mixed liquors in a water-bath to ten fluid ounces, and, when cold, add the rectified spirit, previously mixed with the oil of coriander. Clarify by filtra-*

*tion, and wash what remains on the filter with distilled water until the washings make up the filtrate to sixteen fluid ounces. Then add the sugar, and dissolve by means of a gentle heat. The product should weigh two pounds ten ounces, and should have the specific gravity* 1·310. *Dose,* ʒi. *to* ʒii.

MISTURA SENNÆ COMPOSITA—Compound Mixture of Senna—(Black Draught).—*Take of sulphate of magnesia,* 4 *ounces; extract of liquorice,* ½ *ounce; tincture of senna,* 2½ *fluid ounces; compound tincture of cardamoms,* 10 *fluid drachms; infusion of senna, a sufficiency. Dissolve the sulphate of magnesia and extract of liquorice in fourteen fluid ounces of the infusion of senna, with the aid of a gentle heat, then add the tinctures, and sufficient infusion of senna to make one pint. Dose,* ʒi. *to* ʒiss.

TINCTURA SENNÆ—Tincture of Senna.—*Take of senna, broken small,* 2½ *ounces; raisins, freed from seeds,* 2 *ounces; caraway fruit, bruised, coriander fruit, bruised, of each,* ½ *ounce; proof spirit,* 1 *pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒii.

*Therapeutics.*—Senna acts as a safe, energetic, and somewhat stimulant purgative, but is apt to produce nausea, griping, and flatulence; it is, however, seldom given alone, and by a judicious combination with carminatives these unpleasant effects may be controlled. It operates chiefly upon the *small intestines*, causing copious watery evacuations, it increases the mucous secretion as well as the peristaltic contractions, it is a mild, drastic purgative, but, unlike most medicines of that class, it is not poisonous in large doses. It probably stimulates the abdominal and pelvic vessels, thereby increasing catamenial and hemorrhoidal discharges. As an active purge it is useful in constipation, especially in head cases, as it is somewhat of an irritant and derivative. It is better adapted to persons of leuco-phlegmatic than to those of nervous temperament. It is contra-indicated in menorrhagia, threatening abortion, in certain conditions of the uterus and rectum tending to prolapsus, and in inflammatory affections of the stomach and bowels. In most other cases it is a safe and useful remedy for persons of all ages. The *infusion* is a suitable vehicle for saline purgatives. Senna is sometimes given with bohea tea or with coffee, the *Café au Séné* of the French, to render it more palatable.

**Cassiæ Pulpa**—Cassia Pulp.—Officinal plant: *Cassia Fistula*, Linn.; Purging Cassia. Officinal part: The pulp of the pods; imported from the East Indies, or recently extracted from pods imported from the East or West Indies.

*Characters.*—Blackish-brown, viscid, sweet in taste, and somewhat sickly in colour; usually containing the seeds and dissepiments, it contains mucilage, sugar, pectine, and a purgative principle probably allied to cathartic acid.

*Therapeutics.*—Cassia pulp in small doses is laxative, in larger doses purgative, often causing nausea, griping, and flatulence. It is rarely used alone, but may be given in doses of sixty to one hundred and twenty or more grains to children, and in larger doses to adults; as a laxative in febrile and inflammatory cases.

**Hæmatoxyli Lignum**—Logwood.—Officinal plant: *Hæmatoxylum campechianum*, Linn.; the Logwood Tree. Officinal part: The heart-wood sliced: imported from Campeachy in Central America, from Honduras and Jamaica.

*Characters.*—The logs are externally of a dark colour, internally they are reddish-brown; the chips have a feeble agreeable odour, and a sweetish taste; a small portion chewed imparts to the saliva a dark pink colour. Logwood contains volatile oil, tannin, resinous matter, glutinous matter, acetic acid, hæmatin, and various salts. Hæmatin, or hæmatoxylin, occurs as a red crystalline substance, slightly bitter and astringent, soluble in alcohol and in ether, and slightly so in water; it is often found in large red crystals in the fissures of the wood.

DECOCTUM HÆMATOXYLI—DECOCTION OF LOGWOOD.—*Take of log-wood in chips, 1 ounce; cinnamon bark, in coarse powder, 60 grains; distilled water, 1 pint. Boil the logwood in the water for ten minutes in a covered vessel, adding the cinnamon towards the end. Strain the decoction and pour as much distilled water over the contents of the strainer as will make the strained product measure one pint. Dose,* ʒi. *to* ℥ii.

EXTRACTUM HÆMATOXYLI—EXTRACT OF LOGWOOD.—*Take of logwood, in fine chips, 1 pound; boiling distilled water, 1 gallon. Infuse the logwood in the water for twenty-four hours, then boil down to one-half, strain, and evaporate to dryness by a water-bath, stirring with* *a wooden spatula. Iron vessels should not be used. Dose,* 10 *to* 30 *grains.*

*Therapeutics.*—Logwood acts as an astringent, but not of such power as to cause constipation, or materially to derange the digestive system. From the absorption of its colouring matter the urine is tinged. The ordinary uses of hæmatoxylum are those of an astringent, in chronic diarrhœa, and diarrhœa of phthisis, with opium and sulphuric acid, in dysentery, in hemorrhages, in hyper-mucus secretions, &c. It has the advantage as a remedy in the diarrhœa of children of not causing subsequent constipation. It has been recommended for the purpose of arresting the sweating of phthisis, and also in diabetes. As an injection, it is used in leucorrhœa.

**Tamarindus**—Tamarind.—Officinal plant: *Tamarindus indica,* Linn.; common Tamarind Tree. Officinal part: The preserved pulp of the fruit; imported from the West Indies.

*Characters.*—A brown, sweetish sub-acid pulp preserved in sugar, containing strong fibres and brown shining seeds, each enclosed in a membranous coat. The pulp contains citric, tartaric, and malic acids, tartrate of potash, sugar, gum, pectine, &c.

*Therapeutics.*—Tamarind pulp acts as a refrigerant and laxative, and is more or less nutritious. It is given occasionally in febrile attacks. Tamarind whey, or an infusion of tamarinds, may be given as a refrigerant drink. But the pulp is seldom used alone, and is chiefly employed as an ingredient in confection of senna.

**Copaiba**—Copaiva.—Officinal plants: *Copaifera multijuga,* Hayne, and other species of copaifera. Officinal parts: 1. The oleo-resin, obtained from the trunk by incision; chiefly from the province of Para in Brazil. 2. Oleum Copaibæ, oil of copaiva; the oil distilled from copaiva.

*Characters of the Oleo-Resin.*—A transparent viscid fluid, about the consistence of honey, pale or golden yellow, peculiar aromatic odour, and bitter acrid nauseous taste. Perfectly soluble in an equal volume of benzol. Does not become gelatinous after having been heated to 270°. Is not fluorescent.

*Characters of the Oil.*—Colourless or pale yellow, with the odour and taste of copaiva.

Copaiva is sometimes spoken of as a balsam; this is erroneous, as it contains neither benzoic nor cinnamic acid. Most of the copaiva of commerce is imported from Para and Maranham, in Brazil, and is believed to be yielded by *Copaifera multijuga.* Copaiva is obtained by making incisions into the stems of the trees during the very hot summer months, and the oleo-resin is said to flow from these wounds with such force as, in some cases, to cause a loud noise. So rapid is its exudation that a good tree, it is said, when tapped at the right time, will yield as much as twelve pounds in three hours. The older trees are sometimes tapped successfully two or three times a-year. The oleo-resin is a clear, transparent liquid, having the consistency of olive oil, a pale straw colour, a peculiar resino-balsamic odour, and a bitter, acrid, nauseous taste. Its specific gravity varies, but is usually less than that of water. When kept for a length of time the volatile oil escapes, and the liquid becomes darker, thicker, and less odorous. It is soluble in alcohol, in ether, and in the fixed and volatile oils, but is insoluble in water. In all its physical properties copaiva is subject to wide modifications, and also in the proportionate quantities of oil and resin, differences which depend chiefly upon the species by which the oleo-resin is produced.

Copaiva consists chiefly of a volatile oil and a resin. *Oleum Copaibæ*, ($C_{10}H_{16}$), the volatile oil of copaiva, is prepared by distilling the oleo-resin with water; it should be nearly, if not quite colourless, and possess the taste and odour of copaiva, and is present in the proportion of 40 to 60 per cent. It is isomeric with oil of turpentine. It is soluble in ether, in sulphuret of carbon, and in alcohol. Its density is 0·878. *Resin of Copaiba* ($C_{20}H_{30}O_2$), is the residuum after the volatile oil has been abstracted by distillation from the oleo-resin, and occurs as a brownish resinous mass. It consists of two resins, called respectively *Copaivic acid* and *Viscid resin of Copaiva:* these are easily separable by rectified spirit, which dissolves the copaivic acid, but leaves the viscid resin. *Copaivic acid* is isomeric with pinic acid, and constitutes about fifty per cent. of the oleo-resin. It is amber-coloured, crystallizable, and brittle; soluble in alcohol, rectified spirit, ether, and in volatile and fixed oils. Its alcoholic solution reddens litmus, and it forms copaivates with bases.

*Therapeutics.*—Copaiva acts as a general and topical stimulant, occupying a place between the balsams and the turpentines. In medicinal doses it creates a feeling of warmth in the stomach, and is generally followed by unpleasant eructations, nausea, and sometimes by vomiting; it may also cause severe griping and purging. In over-doses it is apt to cause severe gastric irritation, vomiting, griping and purging, headache, hot skin, thirst, and sometimes ischuria and hæmaturia. It imparts its odour to the breath and to the urine. An eruption upon the skin, varying somewhat in character, but resembling urticaria or measles, is apt to follow the internal use of copaiva; it is distinguished by the absence of fever, it does not begin on the face and spread downwards, but is patchy, and prefers the neighbourhood of joints, and disappears if the copaiva is withheld. To make sure, test the urine. On the addition of nitric acid a milkiness is produced, from precipitation of the resin, somewhat resembling albumen, but differs in being soluble by heat or in alcohol. Copaiva acts as a stimulant to the mucous membrane generally, but especially to the genito-urinary tract, and is chiefly used as a remedy for gonorrhœa. Some practitioners employ it in the early and inflammatory stage of this disease, others prefer to wait until the acute symptoms have been combated by antiphlogistic means. This latter plan is probably in the majority of cases the most satisfactory. Its effect in gonorrhœa is due to a double action, viz., the constitutional action of the balsam, and the local action of the resin dissolved in the urine; this explains why it is not so useful in the treatment of gonorrhœa in the female as in the male, because in the former the vagina with which the urine does not come in contact, is the principal seat of the inflammation, and also why copaiva injected locally is not successful. In other inflammatory affections of the same tract of mucous membrane, copaiva is sometimes used with advantage, as in catarrhus vesicæ, but it must be stopped at once if it gives rise to increased irritation of the bladder. It may also be given in leucorrhœa; but it is to be remembered that it imparts a certain odour which is not generally considered creditable. It is also given in chronic affections of the pulmonary mucous membrane of an exhausting character, attended by profuse expectoration; but it is only in old-standing cases without inflammatory symptoms, in persons of debilitated and torpid constitution, that the stimulating effects of copaiva can be tolerated. The oil of copaiva is much less efficient than the oleo-resin, the resin may be given as a diuretic in dropsy.

*Dose.*—Of the oleo-resin, ten minims to one fluid drachm; of the oil of copaiva, ten, twenty, or thirty minims. The resin of copaiva may be given in doses of ten to thirty grains.

Copaiva may be given dropped upon sugar; made into pills with calcined magnesia or hydrate of lime; made into emulsion with mucilage, or with alkalies, or with yolk of egg; floated upon water flavoured with tincture of orange peel; in gelatine capsules; or in other forms; the object being to disguise its taste as much as possible. It may be combined with other drugs to prevent the griping and purging which it sometimes occasions.

*Sub-Order* 3. *Mimoseæ.*

**Acaciæ Gummi**—Gum Acacia.—Officinal plants: One or more undetermined species of *Acacia*, Linn. Officinal part: A gummy exudation from the stem; collected chiefly in Cordofan, in Eastern Africa, and imported from Alexandria.

*Characters.*—In spheroidal tears, usually from half-an-inch to an inch in length, nearly colourless, and opaque from numerous minute cracks, or in fragments with shining surfaces; brittle; bland and mucilaginous in taste; insoluble in alcohol, but soluble in water. The aqueous solution forms with subacetate of lead an opaque white jelly. If an aqueous solution of iodine be added to the powder, or to a solution formed with boiling water and cooled, there is no appearance of a violet or blue colour.

Gum arabic consists chiefly of the soluble gum *Arabin*, but some of the inferior kinds also contain the insoluble gum *Bassorin*. Gum is soluble in water, but insoluble in alcohol, which precipitates it from its watery solution. Perchloride of iron forms a brown jelly with it. Gum has a slightly acid reaction, due to the acid nature of arabin, which consists of gummic acid, $C_{12}H_{22}O_{11}$, in combination with lime, magnesia, and potash, 70 per cent., the remainder consisting of water and salts.

MUCILAGO ACACIÆ—MUCILAGE OF GUM ACACIA.—*Take of gum acacia, in small pieces, 4 ounces; distilled water, 6 fluid ounces. Put the gum and water in a covered earthen jar, and stir them frequently until the gum is dissolved. If necessary, strain the solution through muslin. Dose, ad libitum.*

*Therapeutics.*—Gum arabic acts topically as a demulcent and emollient; it does not produce any apparent constitutional effects, but is supposed to diminish irritation of the urinary passages, probably acting only as a diluent in virtue of the water taken along with it. It has been recommended, rather as an article of diet than as a medicine, in diabetes, as a substitute for amylaceous food, as it is not converted into sugar, but its employment in this disease is not satisfactory, as it is extremely doubtful if any is absorbed. It is given to allay cough and irritation of the throat and air-passages; to allay irritation of the genito-urinary mucous membrane, and to protect the stomach in irritant poisoning. Topically, a thick solution has been recommended as an application to burns and scalds, to chapped nipples, &c.; and powdered gum has been successfully employed, blown into the nostril, to arrest epistaxis. But it is chiefly employed for pharmaceutical purposes, to suspend heavy oleaginous or resinous insoluble substances in mixtures or emulsions; to form lozenges, certain pill masses, &c.

**Catechu Nigrum**—(Not officinal) Black Catechu.—From *Acacia Catechu*, Wild. The Catechu Acacia. An extract of the heart-wood; imported from Pegu. Catechu Nigrum was formerly officinal, but has been omitted in the present edition of the "British Pharmacopœia." The Catechu is an extract from the heart-wood, and is made up in masses consisting of layers enveloped in rough leaves. These masses are of a blackish-brown colour, shining, heavy, bitter, and very astringent. It is called by the natives Kut or Kutch. During the season for preparing it, the manufacturers live in tents in the jungle. Selecting suitable trees, they cut their duramen or heart-wood into small chips, and place them with a little water in small earthen pots, arranged in a double row upon a fireplace built of mud. When a certain quantity of the water has been dissipated by boiling, the clear decoction is removed and strained into another series of pots, when it is evaporated to a proper consistence, and then poured into clay moulds. This variety of Catechu is in no respect therapeutically different from the pale or officinal variety. It is a simple astringent, and may be administered in doses of ten to sixty grains in diarrhœa.

**ROSACEÆ**—The Rose Order.—Trees, shrubs, or herbs, inhabiting various parts of the world, but chiefly the temperate climates. The plants of the order vary in their medicinal properties; in some cases the barks and roots are astringent; the seeds, flowers, leaves, and young shoots of many of the plants furnish hydrocyanic or prussic acid, and are occasionally poisonous. Many of the plants supply succulent, edible fruits. Officinal plants: *Amygdalus communis, Prunus domestica, Prunus laurocerasus. Rosa canina, Rosa gallica, Rosa centifolia, Brayera anthelmintica.*

**Amygdala Dulcis**—The Sweet or Jordan Almond.—Officinal plant: *Amygdalus communis*, var. *dulcis*, D.C.; Officinal parts:—1. The seed; from trees cultivated about Malaga. 1. *Oleum Amygdalæ*, Almond Oil; the oil expressed from bitter and sweet almonds.

*Characters.*—Above an inch in length, lanceolate, acute, with a clear cinnamon brown seed-coat, and a bland, sweetish, nutty-flavoured kernel; the bitter almond is the smaller of the two.

MISTURA AMYGDALÆ—ALMOND MIXTURE.—*Take of compound powder of almonds, 2½ ounces; distilled water, 1 pint. Rub the powder with a little of the water into a thin paste, then add the remainder of the water, and strain through muslin. Dose, 1 to 2 oz.*

PULVIS AMYGDALÆ COMPOSITUS—COMPOUND POWDER OF ALMONDS. — Confectio Amygdalæ, *Lond.;* Conserva Amygdalarum, *Ed.* — *Take of sweet almonds,* 8 *ounces; refined sugar, in powder,* 4 *ounces; gum acacia, in powder,* 1 *ounce. Steep the almonds in warm water until their skins can be easily removed; and when blanched, dry them thoroughly with a soft cloth, and rub them lightly in a mortar to a smooth consistence. Mix the gum and the sugar, and adding them to the pulp, gradually rub the whole to a coarse powder. Keep it in a lightly-covered jar. Dose,* 60 *to* 120 *grains.*

*Therapeutics.*—Sweet almonds, when fresh, are nutritive, demulcent, and emollient; in consequence of the oil which they contain they are somewhat indigestible, especially when rancid. The skins or husks of sweet almonds have been known to cause considerable irritation of the alimentary canal, attended with œdema of the face and urticaria; hence they are blanched when used as dessert. Bitter almonds are poisonous, producing effects similar to those of poisoning by hydrocyanic acid. Almond mixture is used, either alone or as an elegant vehicle for other remedies of the same class, as a demulcent in irritable and inflammatory conditions of the mucous membranes. Almond oil is employed in the preparation of spermaceti and simple ointments; and is used externally as an emollient.

**Amygdala Amara**—Bitter Almond.—Officinal plant: *Amygdalus communis,* var. *Amara,* D.C. Officinal part: the seeds, brought chiefly from Mogadore.

*Characters of the seed.*—Resembles the sweet almond in appearance, but is rather broader and shorter; has a bitter taste, and when rubbed with a little water emits a characteristic odour.

It yields by expression,

OLEUM AMYGDALÆ—ALMOND OIL.—This oil is obtainable also from the sweet almond, but is chiefly prepared from the bitter variety, because the former is much more expensive. It consists chiefly of olein. Freshly expressed, it is turbid, but becomes clear by rest and filtration. It is apt to become rancid. It is employed in the preparation of several ointments.

*Characters.*—Pale yellow, nearly inodorous, or having a nutty odour, with a bland oleaginous taste.

OLEUM AMYGDALÆ AMARÆ—(Not officinal).—*Oil of Bitter Almonds, Volatile or Essential Oil of Almonds.*

*Composition.*—This oil does not exist already formed in the bitter almond, but is derived from it by distilling with water the cake which remains after the fixed oil has been expressed. Both varieties of almond contain fixed oil, an albuminous principle, gum, &c., but the bitter almond contains in addition a crystalline glucoside amygdalin ($C_{20}H_{27}NO_{11}+{}_3H_2O$), which under the influence of emulsin in the presence of water splits up into prussic acid, essential oil, and glucose, thus—$C_{20}H_{27}NO_{11}+{}_3H_2O=HCN+C_7H_6O+{}_2C_6H_{12}O_6$. The amygdalin and the emulsin of the almond are contained in separate cells, and it is not until these are crushed, as in the expression of the fixed oil, that they are brought into contact; but still the volatile oil is not produced until water is added, as in the distillation, when the emulsin, acting the part of a ferment, and hence also called *Synaptase*, converts the amygdalin into the complex substance known as oil of bitter almonds. Emulsin, also called the vegetable albumen of almonds, is coagulated by boiling water, and therefore if a heat equal to 212° be employed in the expression of the fixed oil, which is usually cold drawn, it can no longer act as a ferment, and would not then produce the volatile oil. It is to this emulsion also that suspension of the fixed oil in almond emulsion is due. Hydrocyanic acid, grape sugar, formic acid, and water, are also derived from the amygdalin at the same time as the essential oil.

Volatile oil of bitter almonds is highly poisonous. Its odour is commonly said to be like that of the hydrocyanic acid, but it has a peculiar odour, in addition to that of prussic acid. It is usually of a golden-yellow colour, has a bitter, acrid taste, burns with a white flame, and is soluble in alcohol and in ether. Sulphuric acid gives with it a crimson-red thick liquid, which becomes a yellow emulsion on the addition of water. As met with in commerce, it consists chiefly of hydruret of benzule, hydrocyanic acid, a little benzoic acid, benzoine, and benzimide. This essential oil acts, in accordance with the hydrocyanic acid which it contains, as a most energetic poison. It is rarely used as a medicine in this country, in consequence of the uncertainty of its strength. When given internally, the dose should not be greater than a quarter of a drop, cautiously increasing to a drop or a drop and a-half, suspended in emulsion. Perfumers use it for scenting soap, &c., and confectioners for making almond flavouring. Many cases of poison are recorded from eating confectionery flavoured with a too strong spirituous solution of the oil: macaroons, ratafia cakes, the almond icing of bride's cake, and noyau, all contain almond flavouring.

It is convenient to place here the officinal diluted hydrocyanic acid, although it is not derived from a vegetable source.

**Acidum Hydrocyanicum Dilutum**—Diluted Hydrocyanic Acid—Prussic Acid—Hydrocyanic Acid, or HCN, dissolved in water, and constituting two per cent. of the solution.

PREPARATION.—*Take of yellow prussiate of potash, 2¼ ounces; sulphuric acid, 1 fluid ounce; distilled water, 30 fluid ounces, or a sufficiency. Dissolve the prussiate of potash in ten ounces of the water, then add the sulphuric acid, previously diluted with four ounces of the water and cooled. Put the solution into a flask or other suitable apparatus of glass or earthenware, to which are attached a condenser and a receiver arranged for distillation; and having put eight ounces of distilled water into the receiver, and provided efficient means for keeping the condenser and receiver cold, apply heat to the flask, until by slow distillation the liquid in the receiver is increased to seventeen fluid ounces. Add to this three ounces of distilled water, or as much as may be sufficient to bring the acid to the required strength, so that one hundred grains (or* 110 *minims) of it, precipitated with a solution of nitrate of silver, shall yield ten grains of dry cyanide of silver.*

*Characters.*—A colourless liquid with a peculiar odour. Specific gravity, 0·997. It only slightly and transiently reddens litmus paper. A fluid drachm of it evaporated in a platinum dish leaves no fixed residue. *Dose*, 1 to 6 mins.

Officinal diluted hydrocyanic acid is a limpid, transparent, colourless liquid, having a peculiarly penetrating odour—somewhat resembling, yet readily distinguishable from, that of the volatile oil of bitter almonds—and a warm and bitter taste. The officinal acid contains two per cent. of anhydrous acid. Scheele's acid contains from four to five per cent. of the anhydrous acid; the acid of the London and Dublin Pharmacopœias contained two per cent.; that of the Edinburgh Pharmacopœia 3·3 per cent.

Treated with a minute quantity of a mixed solution of sulphate and persulphate of iron, afterwards with potash, and finally acidulated with hydrochloric acid, it forms Prussian blue. It gives no precipitate with chloride of barium, but with nitrate of silver it gives a white precipitate, entirely soluble in boiling concentrated nitric acid. 270 grains of it rendered alkaline by the addition of solution of soda, require 1000 grain-measures of the volumetric solution of nitrate of silver to be added before a permanent precipitate begins to form, which corresponds to two per cent. of the real acid.

VAPOR ACIDI HYDROCYANICI—INHALATION OF HYDROCYANIC ACID.—*Take of diluted hydrocyanic acid,* 10 *to* 15 *minims*;

*water, cold,* 1 *fluid drachm. Mix in a suitable apparatus, and let the vapour that arises be inhaled.*

This is a convenient form for administering hydrocyanic acid as a sedative in irritable conditions of the chest.

*Therapeutics.*—Hydrocyanic acid in over-doses acts as a most powerful and rapid poison. Even smelling a bottle containing a strong sample of the acid might produce dangerous effects, and the vapour of the anhydrous acid would be immediately fatal if respired. So quick is it in its action as a poison, that it is very difficult to record accurately the succession of symptoms which follow an over-dose. The following is a collection of symptoms which have been observed in various cases, rather than a necessary result to be observed in any particular case. The poisoning usually begins instantaneously, and when a large dose is taken is seldom protracted beyond a minute or two. There may be heat and constriction of the mouth and fauces, vertigo, tinnitus aurium, faintness, profound insensibility, pupils dilated and insensible to the action of light; more or less of rigidity of the voluntary muscles, or the limbs may be flaccid; pulse weak and fluttering, or imperceptible; skin pallid, cold, and bathed in perspiration; frothing at the mouth; breathing heavy and laboured, with intervals of perfect repose, sometimes stertorous; convulsions are but seldom seen in the human subject, except a dose sufficiently large to kill, and yet not to produce instant death, has been taken. It has been stated that these symptoms are sometimes preceded by a loud shriek, but this has not been established. In small but dangerous doses, the common symptoms are giddiness, faintness, nausea, confusion of intellect, muscular prostration, hurried respiration, and a quick pulse. An odour of hydrocyanic acid may be perceived in the breath and apartment. Although usually exceedingly rapid in its action, there are many cases on record in which persons who have committed suicide by prussic acid have had time to cork the bottle from which the poison had been taken, arrange themselves comfortably in bed, or walk a few paces before the symptoms overcame them. Death generally takes place, when large doses are taken, within from two to ten minutes; and although a few cases are recorded in which death has taken place so long as an hour afterwards, recovery commonly takes place when the patient is kept alive during the first half-hour.

Medicinally, hydrocyanic acid acts as a sedative, calmative, anodyne, and antispasmodic, and it is employed chiefly to diminish the force and frequency of the pulse, to calm nervous excitement, to allay irritability, to soothe pain, and to relieve spasm. When applied externally, it seems to exercise a topical anæsthetic action, causing numbness and insensibility, more or less, to pain, without affecting the nervous centres. It has been given in hypertrophy of the heart, in nervous palpitation, in angina pectoris, in pericarditis, &c.; to allay the cough of phthisis, and that of nervous and hysterical females; to relieve painful and spasmodic affections of the stomach and bowels, in gastrodynia, enterodynia, visceral neuralgia, in chronic vomiting, in pertussis and spasmodic asthma; in various forms of neuralgia, in rheumatism, and in painful diseases such as cancer; in chorea, epilepsy, tetanus, &c. Externally, it is used, sufficiently diluted, to allay the itching and irritation of certain skin diseases, care being taken to avoid broken surfaces.

*Dose.*—Of the officinal diluted acid, one or two minims, cautiously increased up to six or eight minims; the dose may be repeated at intervals of two or three hours, as the effects quickly pass off, and it is advisable to give it either in plain water or other simple vehicle. When prescribed in the form of mixture, directions should be given to shake the bottle before each dose is taken, because the acid is apt to accumulate in the form of vapour in the empty part of the bottle, and would escape if this precaution were not enjoined. As a lotion, one or two fluid drachms to eight ounces of distilled water, taking care to avoid broken surfaces in its application.

*Antidotes.*—It is but seldom that antidotes can be available against a poison so subtle and swift as hydrocyanic acid, when taken in large quantity; nevertheless, all the means at our disposal are to be carefully and perseveringly employed. The indications of treatment are to neutralise the poison, and to sustain the patient's life until its somewhat transient effects have disappeared. As a chemical antidote, give a mixed solution of sulphate of iron and carbonate of potash (or soda or magnesia), which form prussian blue, an inert compound. In addition, cold affusion to the head and chest, inhalation of ammonia or liquor chlori, artificial respiration and subcutaneous injection of atropine.

**Prunum**—Prune.—Officinal plant: *Prunus domestica*, Linn.; The Plum Tree. Officinal part: The dried drupe; from plants cultivated in southern Europe.

*Botany.*—A small tree with smooth branches. *Leaves*, elliptical. *Flowers*, white. *Drupes*, fleshy. *Habitat*, probably originally from Asia, but common in Europe.

*Characters of Prunes.*—About an inch long, ovate, wrinkled, black, sweet, and somewhat austere.

*Therapeutics.*—Prunes are used in pharmacy only in the preparation of confection of senna. They are nutrient, and somewhat laxative, and are used for a variety of domestic purposes.

**Lauroceras Folia**—Cherry-Laurel Leaves.—Officinal plant: *Prunus Laurocerasus*, Linn.; the Common or Cherry-Laurel. Officinal part; The fresh leaves; from plants cultivated in Britain.

*Botany.*—A small tree or evergreen shrub. *Leaves*, short-stalked, oblong, coriaceous, shining on the upper surface, with two to four glands beneath. *Flowers*, in axillary racemes, white. *Drupes*, about the size of a small cherry, round, black, without bloom. *Habitat*, Asia; common in gardens and shrubberies through Europe.

*Characters of the Leaves.*—Ovate-lanceolate or elliptical, distantly toothed, furnished with glands at the base, smooth, and shining, deep green, on strong short footstalks; emitting a ratafia odour when bruised.

*Therapeutics.*—The leaves have a bitter, aromatic, and slightly astringent taste, and give the characteristic amygdalin odour when bruised, but this odour is lost when the leaves are dried. By distillation with water they yield a volatile oil identical with that of bitter almonds.

AQUA LAUROÇERASI—LAUREL WATER.—*Take of fresh leaves of common laurel*, 1 *pound; water*, 2½ *pints. Chop the leaves, crush them in a mortar, and macerate them in the water for twenty-four hours; then distil one pint of liquid. Shake the product, filter through paper, and preserve it in a stoppered bottle. Dose*, 5 *to* 30 *minims.*

*Therapeutics.*—Laurel water acts in accordance with the hydrocyanic acid which it contains. It is of uncertain strength, and is rarely used, the officinal diluted hydrocyanic acid being a much more controllable and trustworthy medicine.

**Roseæ Caninæ Fructus**—Hips.—Officinal plant: *Rosa Canina*, Linn.; The Dog Rose. Officinal part: The ripe fruit of indigenous plants, deprived of the hairy seeds (achenes).

*Botany.*—A variable species, with varieties having distinct names. *Shoots*, arched or erect, with uniform hooked prickles. *Leaves*, glandless, naked, or slightly hairy. *Flowers*, rose-red coloured. *Fruit*, scarlet or crimson, ovoid, succulent, with a sweetish acidulous pulp. *Habitat*, indigenous.

*Characters of Hips.*—An inch or more in length, ovate, scarlet, smooth, shining; taste, sweet, subacid, pleasant.

CONFECTIO ROSÆ CANINÆ—CONFECTION OF HIPS.—*Take* *of hips, deprived of their seeds,* 1 *pound; refined sugar,* 2 *pounds. Beat the hips to a pulp in a stone mortar, and rub the pulp through a sieve; then add the sugar, and rub them well together. Dose,* 60 *grs. and upwards.*

*Therapeutics.*—Used in the preparation of *Pilula Quiniæ,* and as a pill basis.

**Rosæ Gallicæ Petala**—Red-Rose Petals.—Officinal plant: *Rosa gallica,* Linn. Officinal part: The unexpanded petals, fresh and dried; from plants cultivated in Britain.

*Botany.*—A small shrub. *Shoots,* armed with nearly equal uniform prickles and glandular bristles intermixed. *Leaflets,* stiff, elliptical, rugose. *Flowers,* several together, large, erect, with leafy bracts. *Habitat,* south of Europe; cultivated in gardens in this country.

*Characters of the Petals.*—Colour, fine purplish-red, retained after drying; taste, bitterish, feebly acid, and astringent; odour, roseate, developed by drying. This plant is cultivated for medicinal purposes at Mitcham; the unexpanded petals are much more astringent than the full-blown flowers.

CONFECTIO ROSÆ GALLICÆ—CONFECTION OF ROSES.—*Take of fresh red-rose petals,* 1 *pound; refined sugar,* 3 *pounds. Beat the petals to a pulp in a stone mortar, add the sugar, and rub them well together. Dose,* 60 *grs. or more.*

INFUSUM ROSÆ ACIDUM—ACID INFUSION OF ROSES.—*Take of dried red-rose petals, broken up,* ¼ *ounce; diluted sulphuric acid,* 1 *fluid drachm; boiling distilled water,* 10 *fluid ounces. Add the acid to the water, infuse the petals in the mixture in a covered vessel for half-an-hour, and strain. Dose* 1 *to* 2 *ounces.*

SYRUPUS ROSÆ GALLICÆ—SYRUP OF ROSES.—*Take of dried red-rose petals,* 2 *ounces; refined sugar,* 30 *ounces; boiling distilled water,* 1 *pint. Infuse the petals in the water for two hours, squeeze through calico, heat the liquor to the boiling point, and filter. Dissolve the sugar in the liquor by means of heat. The product should weigh two pounds fourteen ounces, and should have the specific gravity,* 1·335. *Dose,* ʒi. *and upwards.*

*Therapeutics.*—The preparations of the red-rose petals are chiefly used to give colour and flavour, and to perform the part of vehicles to other medicines. They are somewhat astringent, and the infusion forms an agreeable refrigerant and astringent.

**Rosæ Centifoliæ Petala**—Cabbage Rose Petals.—Officinal plant: *Rosa Centifolia*, Linn.; The Hundred-Leaved or Cabbage Rose. Officinal part: The fresh petals fully expanded; from plants cultivated in Britain.

*Botany.*—A bushy shrub. *Shoots*, erect, rather thickly covered with nearly straight prickles, intermixed with glandular hairs. *Leaflets*, five to seven, oblong or ovate, glandular at the margin; hairy beneath. *Flowers*, several together, drooping. *Habitat*, Asia; cultivated at Mitcham for medicinal purposes, and in gardens commonly.

*Characters of the Petals.* — Taste, sweetish, bitter, and faintly astringent; odour, roseate; both readily imparted to water. The petals contain a volatile oil (Attar of Roses), which gives them a delightful fragrance.

AQUA ROSÆ—ROSE WATER.—*Take of fresh petals of the hundred-leaved rose (or an equivalent quantity of the petals preserved while fresh with common salt),* 10 *pounds; water,* 2 *gallons. Distil one gallon.*

*Therapeutics.*—Rose water is used chiefly, on account of its fragrance, in the preparation of lotions and collyria. It is an ingredient of *Mistura Ferri Composita*, and of *Trochisci Bismuthi.*

**Cusso**—Kousso.—Officinal plant: *Brayera anthelmintica*, D.C.; The Kousso Tree. Officinal part: The flowers, collected in Abyssinia.

*Characters.*—Flowers small, reddish-brown, on hairy stalks, outer limb of calyx five-parted, the segments oblong or oblong lanceolate reticulated. The flowers of commerce are met with in bunches, the male and female flowers being mixed together; they have a fragrant balsamic odour, and a somewhat acrid and disagreeable taste. They contain a volatile oil, a bitter, acrid resin, and tannin. This acrid resin Koussin ($C_{31},H_{38},O_{10}$), appears to be the active principle when in combination (BUCHEIM), as it appears inert alone.

INFUSUM CUSSO—INFUSION OF KOUSSO.—*Take of Kousso, in coarse powder,* ½ *ounce; boiling distilled water,* 8 *fluid ounces. Infuse in a covered vessel for fifteen minutes, without straining. Dose,* 4 *to* 8 *ounces, including the flowers.*

*Therapeutics.*—Kousso acts as an anthelmintic, and is effectual in both kinds of tape worm, namely *Tænia solium* and *Bothriocephalus* *latus.* It operates, probably, by a toxic or poisonous effect upon the worm, and not by a mere mechanical or purgative influence; it is therefore properly regarded as a *vermicide.* It does not usually produce any marked physiological effects; but may be followed by nausea or vomiting, thirst, and a very slight action upon the bowels. It usually requires to be followed by a purge, and its disagreeable taste is best concealed by a little lemon juice.

**MYRTACEÆ**—The Myrtle Order.—Trees or shrubs inhabiting tropical and subtropical regions. Their medicinal properties are due to a pungent volatile oil; some of the plants possess astringent properties, and some yield gummy and saccharine matter. Officinal plants: *Caryophyllus aromaticus, Eugenia pimenta, Melaleuca minor, Punica Granatum.*

**Caryophyllum**— Cloves.— Officinal plant: *Caryophillus aromaticus,* Linn.; The Clove Tree. Officinal parts:—1. The unexpanded flower-bud, dried; cultivated in Penang, Bencoolen, and Amboyna. 2. *Oleum Caryophylli,* Oil of Cloves. The oil distilled in England from cloves.

*Characters.*—About six lines long, dark reddish-brown, plump, and heavy, consisting of a nearly cylindrical body surmounted by four teeth and a globular head, with a strong fragrant odour, and a bitter, spicy, pungent taste. It emits oil when indented with the nail.

OLEUM CARYOPHYLLI—Oil of Cloves.—The oil distilled in Britain from cloves. *Dose,* 2 to 8 mins.

*Characters.*—Colourless when recent, but gradually becoming red-brown, having the odour of cloves and a pungent spicy taste. Sinks in water.

INFUSUM CARYOPHYLLI—Infusion of Cloves.—*Take of cloves, bruised,* ¼ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for half-an-hour, and strain. Dose,* ℥ss. *to* ℥ii.

*Therapeutics.*—Cloves have an aromatic taste and odour, and agree in their medicinal properties, in most respects, with the other spices, their activity depending chiefly upon the volatile oil. They are used as a condiment with food; medicinally, they act as stimulants, carminatives, and stomachics, but they are rarely given alone. They are chiefly employed to give flavour, and to act as corrective adjuncts to other medicines.

**Pimenta**—Pimento.—Officinal plant: *Eugenia pimenta*, D.C. The Allspice Tree. Officinal parts:—1. The dried unripe berries; from the West Indies. 2. *Oleum pimentæ*, Oil of Pimento; the oil, distilled in England from Pimento.

*Characters of the Berries.*—Of the size of a small pea, brown, rough, crowned with the teeth of the calyx, yellowish within, and containing two dark brown seeds. Odour and taste aromatic, hot, and peculiar.

*Characters of the Oil.*—Colourless, or slightly reddish when recent, but becoming brown by age, having the odour and taste of pimento. Sinks in water. *Dose*, 2 to 6 mins.

AQUA PIMENTÆ—PIMENTO WATER.—*Take of pimento, bruised,* 14 *ounces; water,* 2 *gallons. Distil one gallon. Dose,* ℥i. *to* ℥ii.

*Therapeutics.*—Pimento—Allspice or Jamaica pepper—acts in accordance with its carminative, stimulant, and aromatic properties, which are derived from its volatile oil. It is not much used, and only as a flavouring or corrective adjunct or vehicle for other medicines.

**Oleum Cajuputi**—Oil of Cajuput.—Officinal plant: *Melaleuca minor*, D.C.; the Cajuput Tree, Officinal part: The oil, distilled from the leaves in the Molucca Islands.

*Characters of the Oil.*—Very mobile, transparent, of a fine, pale bluish-green colour. It has a strong agreeable odour, and a warm aromatic taste, and leaves a sensation of coldness in the mouth. *Dose*, 2 to 10 mins.

SPIRITUS CAJUPUTI—SPIRIT OF CAJUPUT.—*Take of oil of cajuput,* 1 *fluid ounce; rectified spirit,* 49 *fluid ounces. Dissolve. Dose,* ʒss. *to* ʒi.

*Therapeutics.*—Cajuput oil acts as a powerful diffusible stimulant, sudorific, and antispasmodic; it is allied in action to valerian and camphor, but does not produce mental disturbance in large doses as these do. It is not much used in this country; its reputation in cholera soon faded, and it is now only employed as a diffusible stimulant in cases requiring prompt rousing of the vital energies. It acts especially upon the nervous system, and is useful in low fevers, in paralytic affections, and in painful spasmodic affections, especially when these are associated with hysteria. It is occasionally employed in rheumatism, as a stimulating sudorific. Externally, combined with olive oil, it is used as a rubefacient liniment.

**Granati Radicis Cortex**—Pomegranate Root.—Officinal plant: *Punica Granatum*, Linn.; the Pomegranate. Officinal part: The bark of the root, fresh or dried; obtained from the south of Europe.

*Characters of the Root-Bark.*—In quills or fragments of a greyish-yellow colour externally, yellow internally, having a short fracture, little odour, and an astringent slightly bitter taste.

DECOCTUM GRANATI RADICIS—DECOCTION OF POMEGRANATE ROOT.—*Take of pomegranate root-bark, sliced, 2 ounces; distilled water, 2 pints. Boil down to a pint, and strain, making the strained product up to a pint, if necessary, by pouring distilled water over the contents of the strainer. Dose, 2 to 6 oz.*

*Therapeutics.*—Pomegranate is astringent in all its parts, due to the presence of tannin. In large doses the root-bark causes nausea and purging, and occasionally vomiting and vertigo. It has been recommended as a vermifuge in tape-worm, but it often fails to remove the worm. The rind of the fruit is occasionally used for the sake of its astringency in relaxed throats and mucous discharges. The ripe fruit may be eaten as a slightly astringent, refreshing refrigerant in febrile cases, especially of the bilious type.

**CUCURBITACEÆ**—The Gourd or Cucumber Order.—Succulent climbing plants, chiefly inhabitants of hot climates, abounding in India and South America. The plants generally possess acrid, bitter, and drastic properties, but many of the cultivated fruits are edible. Officinal plants: *Citrullus Colocynthis*, *Ecbalium officinarum.*

**Colocynthidis Pulpa**—Colocynth.—Officinal plant: *Citrullus Colocynthis*, Schrad.; the Bitter Cucumber, Bitter Apple, or Colocynth. Officinal part: The dried decorticated fruit, freed from the seeds; imported chiefly from Smyrna, Trieste, France, and Spain.

*Characters.*—Light spongy white or yellowish-white in colour, intensely bitter in taste. The fruit is gathered in autumn, when ripe and yellow. As imported, it is either peeled or unpeeled; its pulp is nearly white, is inodorous, but has a very bitter taste; the seeds of the pepo are smooth, and vary in colour from white or yellowish-white to brown. Two kinds of colocynth are recognised in commerce, namely, Turkey and Mogadore, or peeled and unpeeled. Turkey, or peeled, colocynth is imported from Smyrna, Constantinople, Alexandretta, &c., and there is also a peeled variety imported from Spain and France. The Turkey variety is larger, more plump, and about double the value of the Spanish. They are about three inches in diameter, more or less round, whitish, and bear the marks made in cutting away the rind. Mogadore, or unpeeled colocynth, is not largely imported, and is but little employed for medicinal purposes. The fruit is larger than the Turkey variety, and bears a smooth, yellow, hard rind. The active principle of colocynth, termed *colocynthin*, lies in the pulp; it is a bitter yellowish-brown, translucent, friable substance, soluble in water and in alcohol, but not in ether. In its chemical nature it is allied to the Glucosides, and has the probable formula ($C_{56}H_{84}O_{23}$).

EXTRACTUM COLOCYNTHIDIS COMPOSITUM — Compound Extract of Colocynth.—*Take of colocynth pulp*, 6 *ounces; extract of socotrine aloes*, 12 *ounces; resin of scammony*, 4 *ounces; hard soap, in powder*, 3 *ounces; cardamom seeds, in fine powder*, 1 *ounce; proof spirit*, 1 *gallon. Macerate the colocynth in the spirit for four days; press out the tincture and distil off the spirit, then add the aloes, scammony, and soap, and evaporate by a water-bath until the extract is of a suitable consistence for forming pills, adding the cardamoms towards the end of the process. Dose*, 5 *to* 10 *grains.*

PILULA COLOCYNTHIDIS COMPOSITA—Compound Pill of Colocynth.—*Take of colocynth pulp, in powder*, 1 *ounce; Barbadoes aloes, in powder, scammony, in powder, of each*, 2 *ounces; sulphate of potash, in powder*, ½ *ounce; oil of cloves*, 2 *fluid drachms; distilled water, a sufficiency. Mix the powders, add the oil of cloves, and beat into a mass with the aid of the water. Dose*, 5 *to* 10 *grains.*

PILULA COLOCYNTHIDIS ET HYOSCYAMI — Pill of Colocynth and Hyoscyamus.—*Take of compound pill of colocynth*, 2 *ounces; extract of hyoscyamus*, 1 *ounce. Beat them into a uniform mass. Dose*, 5 *to* 10 *grains.*

*Therapeutics.*—Colocynth in small doses, and in one of the above combined forms, is a useful purgative, acting both on the muscular and secreting structures of the bowels, and giving an impetus to the abdominal viscera generally. It also acts somewhat as a diuretic. In large doses it is a powerful hydragogue and drastic cathartic. In excessive doses it proves fatal by causing gastro-intestinal inflammation, attended with severe griping and most excruciating pains. Professor Christison mentions a case in which a tea-spoonful and a-half, or about ninety grains, of the powder proved fatal. Colocynth acts chiefly upon the large intestines, not only as a topical irritant, but also by the absorption of its active principle into the circulation. It also stimulates the pelvic viscera. It is useful as a purgative in habitual constipation, as a derivative in head cases, as a hydragogue in dropsies, &c. It is contra-indicated in abdominal inflammations, in pregnancy, in menorrhagia, &c. Opiates, poultices to the abdomen, diluents, and demulcents, may be given when the poisonous results of colocynth supervene.

**Elaterium**—Elaterium.—Officinal plant: *Ecbalium officinarum*, Richard; the Squirting Cucumber. Officinal part: A sediment from the expressed juice of the fruit.

*Botany.*—Annual. *Stem*, trailing, hispid, scabrous, glaucous, without tendrils. *Leaves*, on long bristly stalks, cordate, somewhat lobed, crenately-toothed. *Flowers*, axillary, monœcious, yellow. *Fruit*, a pepo, muricated, elliptical, one inch and a-half long. When ripe it separates from its stalk, and forcibly ejects its juice and seeds through the basilary aperture at the point which was previously in contact with the stalk, hence called *squirting* cucumber. *Seeds*, brown, compressed, reticulate. *Habitat*, south of Europe; cultivated at Hitchin and Mitcham.

PREPARATION.—*Take of squirting cucumber fruit, very nearly ripe, 1 pound. Cut the fruit lengthwise, and lightly press out the juice. Strain it through a hair sieve, and set it aside to deposit. Carefully pour off the supernatant liquor; pour the sediment on a linen filter, and dry it on porous tiles with a gentle heat. The decanted fluid may deposit a second portion of sediment, which can be dried in the same way.*

*Characters.*—In light friable slightly incurved cakes, about one line thick, greenish-grey, acrid and bitter; fracture finely granular. Does not effervesce with acids; yields half its weight to boiling rectified spirit. This solution, concentrated and added to warm solution of potash, yields on cooling not less than twenty per cent. of elaterine in colourless crystals. *Dose*, one-twelfth to one-half grain.

PULVIS ELATERII COMPOSITUS—COMPOUND POWDER OF ELATERIUM.—*Take of elaterium, 10 grains; sugar of milk, 90 grains. Rub them together in a mortar until they are reduced to fine powder and intimately mixed. Dose, ½ gr. to 5 grains.*

The active principle of the fruit exists only in the juice which surrounds the seeds. The finest variety of elaterium is obtained by gathering the fruit as nearly ripe as it is safe to leave it, lest it should burst spontaneously. There are several varieties of elaterium, but two only are distinguished in commerce, namely, English and Maltese. Maltese elaterium, imported from Malta, is usually in larger flakes, and is paler in colour than the English kind, and has often pieces of the paper upon which it was dried adhering to it. It is not a trustworthy kind, being often mixed with chalk and starch, and with syrup of buckthorn to darken its colour. The more important constituents of elaterium are elaterin, green resin, bitter matter, &c. Elaterine ($C_{20}H_{28}O_5$), the active principle of elaterium, may be separated by the process mentioned in the above purity test. It occurs in colourless rounded prismatic crystals, of silky appearance, is insoluble in water, but soluble in hot alcohol; it is neutral to test-paper, is inodorous, but has an intensely bitter taste, and is of the nature of a glycoside. Good elaterium should yield not less than from twenty to twenty-five per cent. of elaterine. If chalk be present it will effervesce with acids.

*Therapeutics.*—Elaterium acts topically as an irritant. Internally, it acts topically by irritating the mucous membrane of the stomach and bowels, causing both vomiting and purging. One-eighth of a grain of good elaterium purges violently, equal to the effects produced by one-sixteenth to one-twelfth of a grain of elaterin; but the elaterium of the shops is seldom quite pure, and about double that quantity is required for a full dose. It is a violent drastic, hydragogue, cathartic, causing severe griping and numerous liquid evacuations. It is chiefly employed in passive dropsies; it is prompt, energetic, and certain in its effects, and reduces the effused fluid more effectually than any other remedy of its class both in anasarca and ascites, and often succeeds in such cases when other purgatives and diuretics have failed. It may be given either in one full dose, taking care to support the patient during its operation, or, better, in small doses, repeated at intervals of five or six hours, till free evacuation of the bowels takes place. It is contra-indicated in cases complicated with inflammatory symptoms of the stomach or bowels, and also in extreme debility. It is occasionally employed as a derivative in head cases, and as an active purgative in obstinate constipation. It has been recommended also in certain forms of gout, but its chief employment is in dropsies. Opiates, demulcent drinks, and enemata, and poultices or fomentation to the abdomen, may be used to allay the effects of an over-dose; at the same time, whilst antiphlogistic measures are employed to reduce local inflammation, the patient must be supported by suitable stimulants. Give it in combination with extract of hyoscyamus, especially in renal disease (HARLEY), to prevent it causing persistent diarrhœa; and in dropsy from cardiac disease (Hope), with some stimulant to prevent depression, which may be dangerous in these cases.

**UMBELLIFERÆ or APIACEÆ**—The Umbelliferous Order.—Herbs or small shrubs, with solid or hollow stems, inhabiting the northern parts of the northern hemisphere, and a corresponding elevation upon the high mountains of the tropics. The properties of the plants are various; some are edible, some act as acro-narcotic poisons, some as stimulants and tonics due to a volatile oil, others as antispasmodics due to the presence of a fetid gum-resin. Officinal plants: *Carum curui, Pimpinella anisum, Fœniculum dulce, Anethum graveolens, Coriandrum sativum, Narthex assafœtida, Dorema ammoniacum, Conium maculatum, Sumbul Radix.*

**Carui Fructus**—Caraway.—Officinal plant: *Carum carui,* Linn.; Common Caraway. Officinal parts:—1. The fruit dried; cultivated in England and Germany. 2. *Oleum carui,* Oil of Caraway; the oil, distilled in England from caraway.

*Botany.*—Biennial. *Root,* fusiform. *Stem,* branched, about two feet high. *Leaves,* bipinnate. *Flowers,* white or pale flesh colour. *Mericarps,* or seeds, as they are commonly called, one and a-half to two lines long, slightly curved inwards, with five primary ridges of a lighter colour than the rest, which is brownish; they have a peculiar aromatic agreeable odour, and a warm taste, due to a volatile oil contained in the vittæ or little cells. *Habitat,* meadows and pastures throughout Europe; cultivated in Essex.

*Characters of the Fruit or Mericarp.*—Fruit usually separating into two parts, which are about two lines long, curved, tapering at each end, brown, with five paler longitudinal ridges; having an agreeable aromatic odour, and a spicy taste.

*Characters of the Oil.*—Colourless or pale yellow, odour aromatic, and taste spicy. *Dose,* 2 to 10 minims.

The fruit, commonly called caraway seeds, yields about five per cent. of the volatile oil by distillation with water. The oil is apt to turn yellow, and ultimately brown, by keeping.

AQUA CARUI—Caraway Water.—*Take of caraway fruit, bruised,* 1 *pound; water,* 2 *gallons. Distil one gallon. Dose,* ℥i. *to* ℥ii.

*Therapeutics.*—Caraway seeds are chiefly used in confectionery. As a medicine, caraway is aromatic, carminative, and somewhat stimulant.

The oil and the water are chiefly used as corrective and flavouring adjuncts or vehicles to other medicines, and occasionally to relieve the flatulent colic of children.

**Oleum Anisi**—Oil of Anise.—Officinal plants:—1. *Pimpinella Anisum*, Linn.; the Anise. Officinal part: The oil, distilled from the fruit in Europe. *Illicium anisatum*, Linn.; the Star Anise. Officinal part: The oil, distilled from the fruit in China.

*Characters of the Oil.*—Colourless or pale yellow, with the odour of anise, and a warm, sweetish taste. Concretes at 50°. *Dose*, 2 to 8 minims.

The fruit, commonly called aniseed, is latterly compressed, ovate, with a few scattered hairs, and five primary ridges; it has an agreeable aromatic odour, and warm taste, imparted by the volatile oil. The oil prepared from *Pimpinella anisum* congeals at 50°, and does not become fluid again until it reaches 62°; the oil of Star-anise, now an acknowledged adulteration of the former, retains its fluidity at a temperature much below 50°. Spermaceti and camphor are sometimes added to promote the solidification of the oil.

ESSENTIA ANISI—Essence of Anise.—*Take of oil of anise,* 1 *fluid ounce; rectified spirit,* 4 *fluid ounces. Mix. Dose, from* 10 *to* 20 *minims.*

*Therapeutics.*—Oil of anise acts as an aromatic, carminative, and stimulant. It is used as a corrective and flavouring adjunct to other medicines, and in the flatulent colic of children. It is employed also in confectionery.

**Fœniculi Fructus**—Fennel Fruit.—Officinal plant: *Fœniculum dulce*, D.C.; Sweet Fennel. Officinal part: The fruit, imported from Malta.

*Characters of the Fruit.*—About three lines long and one line broad; elliptical, slightly curved, beaked, having eight pale brown longitudinal ribs, the two lateral being double; taste and odour aromatic.

The medicinal properties of the fruit depend upon a volatile oil, which is more agreeable than that which is contained in the fruit of *Fœniculum vulgare*, the common or wild Fennel.

AQUA FŒNICULI—Fennel Water.—*Take of fennel fruit, bruised,* 1 *pound; water,* 2 *gallons. Distil one gallon. Dose,* ʒi. *to* ℥i.

*Therapeutics.*—Fennel acts as a carminative, and is occasionally given in the flatulent colic of children, or as a vehicle for other medicines, but is comparatively rarely used.

**Anethi Fructus**—Dill Fruit.—Officinal plant: *Anethum graveolens*, Linn.; Common Garden Dill. Officinal parts:—1. The fruit, cultivated in England, or imported from middle and southern Europe. 2. *Oleum Anethi*, Oil of Dill; the oil, distilled in Britain from Dill fruit.

*Botany.*—Annual. *Root*, long and tapering. *Stem*, eighteen inches to two feet high, smooth, finely striated, and simply branched. *Flowers*, yellow; umbels long, stalked. *Habitat*, south of Europe, Egypt, &c., cultivated in England.

*Characters of the Fruit.*—Oval, flat, about a line and a-half in length, with a pale, membraneous margin. Odour aromatic, taste warm, somewhat bitter.

*Characters of the Oil.*—Colour pale yellow, odour pungent, taste acrid, sweetish.

AQUA ANETHI—DILL WATER.—*Take of dill fruit, bruised,* 1 *pound; water,* 2 *gallons. Distil one gallon. Dose,* ʒi. *to* ℥i.

*Therapeutics.*—Dill acts as an aromatic stimulant, and is employed as a corrective and flavouring adjunct or vehicle to other remedies, and occasionally in the flatulent colic of children.

**Coriandri Fructus**—Coriander.—Officinal plant: *Coriandrum sativum*, Linn.; the Coriander. Officinal parts:—1. The ripe fruit dried; cultivated in Britain. 2. *Oleum Coriandri*, Oil of Coriander; the oil, distilled in Britain from Coriander fruit.

*Botany.*—Annual. *Stem*, erect, smooth, striated, eighteen inches to two feet high. *Leaves*, bipinnate. *Flowers*, white, or with a reddish tinge. *Habitat*, south of Europe; met with wild, and also cultivated in Essex.

*Characters of the Fruit.*—Globular, nearly as large as white pepper, beaked, finely ribbed, yellowish-brown; has an agreeable aromatic odour and flavour.

*Characters of the Oil.*—Yellowish, having the odour of coriander. *Dose*, 2 to 5 mins.

The properties of the fruit, commonly called coriander seeds, depend upon the volatile oil.

*Therapeutics.*—Coriander is used only as a corrective and flavouring adjunct to other remedies, and is said to be especially useful in disguising the taste and odour of senna.

**Assafœtida**—Assafœtida.—Officinal plant: *Narthex assafœtida*, Officinal part: *A gum-resin*, obtained by incision from the living root, in Afghanistan and the Punjaub.

*Characters of the Gum-Resin.*—In irregular masses, partly composed of tears, moist or dry. The colour of a freshly cut or broken piece is opaque-white, but gradually becomes purplish-pink, and ultimately dull-yellowish or pinkish-brown. Taste bitter, acrid; odour fetid, alliaceous and persistent. It dissolves almost entirely in rectified spirit.

The active constituents of assafœtida are volatile oil, resin, and gum. The volatile oil ($C_6H_{10}S$) or sulphide of allyl, may be obtained by distilling the gum-resin with water and alcohol; it is soluble in alcohol and ether, but scarcely at all in water; when fresh it is colourless, but soon becomes yellowish; it becomes acid by exposure to the atmosphere, readily evaporates, and fills the air with its peculiar odour; when boiled it evolves sulphuretted hydrogen. The odour of the gum-resin is due to this oil. Resin of assafœtida is soluble in alcohol, but in water it is merely held in suspension as an emulsion by the gum.

ENEMA ASSAFŒTIDÆ—Enema of Assafœtida.—Enema fœtidum, *Edinb. Dub.*—*Take of assafœtida,* 30 *grains; distilled water,* 4 *fluid ounces. Rub the assafœtida in a mortar with the water added gradually, so as to form an emulsion.*

PILULA ASSAFŒTIDÆ COMPOSITA—Compound Pill of Assafœtida.—Pilula Galbani Composita, *Lond.* — *Take of assafœtida, galbanum, myrrh, of each,* 2 *ounces; treacle, by weight,* 1 *ounce. Heat all together by means of a water-bath, and stir the mass until it assumes a uniform consistence. Dose,* 5 *to* 15 *grs.*

TINCTURA ASSAFŒTIDÆ—Tincture of Assafœtida.—*Take of assafœtida, in small fragments,* 2½ *ounces; rectified spirits, a sufficiency. Macerate the assafœtida in* 15 *fluid ounces of the spirit for seven days in a closed vessel, with occasional agitation, then filter, and add sufficient rectified spirit to make one pint. Dose,* ʒss. *to* ʒi.

*Therapeutics.*—Assafœtida acts as a stimulant and antispasmodic. It is contra-indicated in inflammatory disorders, and where there i irritation of the alimentary mucous membrane, in consequence of its general and topical stimulating effects. It is employed as an antispasmodic in convulsive disorders, especially those complicated with hysteria, in spasmodic nervous diseases of females, in chorea, epilepsy, uncomplicated fits of hysteria, &c. It is given also as a stimulating expectorant in spasmodic catarrh, especially in chronic cases of the aged. The enema is useful in hysteria, in constipation with flatulence and nervous colicky pains, and in infantile convulsions; also to remove the tympanitic condition of the abdomen in low fevers.

**Ammoniacum**—Ammoniacum.—Officinal plant: *Dorema Ammoniacum.* Officinal part: A gum-resinous exudation from the stem; collected in Persia and the Punjaub.

*Characters of the Gum-Resin.*—In tears or masses; the tears from two to eight lines in diameter, pale cinnamon-brown, breaking with a smooth, shining, opaque-white surface; the masses composed of agglutinated tears; hard and brittle when cold, but readily softening with heat; has a faint odour, and a bitter, acrid, nauseous taste. Rubbed with water, it forms a nearly white emulsion.

The active constituents of ammoniac are volatile oil, resin, and gum: the oil is transparent and light; the resin is reddish-yellow, and is soluble in alkalies, alcohol, and partially in ether; in water it is suspended by means of the gum.

EMPLASTRUM AMMONIACI CUM HYDRARGYRO—AMMONIACUM AND MERCURY PLASTER.—PREPARATION.—*Take of ammoniacum,* 12 *ounces; mercury,* 3 *ounces; olive oil,* 1 *fluid drachm; sublimed sulphur,* 8 *grains. Heat the oil, and add the sulphur to it gradually, stirring till they unite. With this mixture triturate the mercury, until globules are no longer visible; and, lastly, add the ammoniacum previously liquefied, mixing the whole carefully.*

MISTURA AMMONIACI—AMMONIACUM MIXTURE.—PREPARATION.—*Take of Ammoniacum, in coarse powder,* ¼ *ounce; distilled water,* 8 *fluid ounces. Triturate the ammoniacum with the water, gradually added, until the mixture assumes a milky appearance, then strain through muslin. Dose,* ℥ss. *to* ℥i.

*Therapeutics.*—Ammoniac acts like the other fetid gum-resins, but much less powerfully than assafœtida or galbanum, probably because it contains less volatile oil. It is not much employed internally, but may be given in certain chronic pulmonary affections, such as the catarrh and asthmatic affections of old people. Its chief use is in the form of the plaster, as a stimulant application to chronic affections of the joints, and glandular enlargement. The plaster sometimes causes considerable local irritation, followed occasionally by a papular eruption.

**Galbanum**—Galbanum.—A gum-resin, derived from Ferula Galbaniflua, imported from India and the Levant.

*Characters.*—In irregular tears, about the size of a pea, usually agglutinated into masses of a greenish-yellow colour, translucent, having a strong, disagreeable odour, and an acrid, bitter taste.

It is made up of agglutinated tears, mixed with parts of the fruit and pieces of the stem of the plant from which it is obtained. Volatile oil of galbanum may be obtained by distilling the gum-resin with water; it is colourless and limpid, has the odour of galbanum, a hot, acrid taste, and is soluble in alcohol, in ether, and in the fixed oils. Resin of galbanum is soluble in ether and in alcohol; it is dark-brown, transparent, and brittle.

EMPLASTRUM GALBANI.—GALBANUM PLASTER.—PREPARATION.—*Take of galbanum, ammoniacum, yellow wax, of each,* 1 *ounce; lead plaster,* 8 *ounces. Melt the galbanum and ammoniacum together, and strain; then add them to the lead plaster and wax, also previously melted together, and mix the whole thoroughly.*

*Therapeutics.*—Galbanum acts as a stimulant and antispasmodic, less energetic than assafœtida or ammoniacum. Only used externally, in the form of plaster, which is employed as a stimulant and resolvent application to indolent tumours; also to the chest in pulmonary affections, and to the lumbar regions in weakness of the lower extremities.

**Conium**—Hemlock.—Officinal plant: *Conium maculatum,* Linn.; Spotted Hemlock. Officinal parts:—1. *Conii Folia;* the fresh leaves and branches of wild British plants, gathered when the fruit begins to form; and the leaves dried in the sun, or at a temperature not exceeding 120°. 2. *Conii Fructus;* the ripe fruit, dried.

*Botany.*—*Root,* biennial, tap-shaped, fusiform, whitish, six to twelve inches long. *Stem,* round, smooth, glaucous, shining, spotted, hollow, two to six feet high; the spots are dark purple. *Leaves,* tripinnate, with lanceolate pinnatifid leaflets, which are dark-green, shining, and smooth, and emit a disagreeable odour when bruised. *Umbels,* consist of general and partial rays. *Fruit,* ovate, compressed laterally; the seed has a deep hollow groove in front. *Habitat,* hedgerows and waste places in this and other European countries; also in North America and Eastern Asia.

*Characters of the Leaves.*—Fresh leaves, decompound, smooth, arising from a smooth stem with dark-purple spots; they are deep-green, shining, tripinnate, with pinnatifid leaflets, petioles furrowed and sheathing at the base. The leaf rubbed with solution of potash gives out strongly the odour of conia.

*Characters of the Fruit.*—Broadly ovate, compressed laterally;

half-fruit with five-waved or crenated ridges, no vittæ or oil ducts. Reduced to powder, and rubbed with solution of potash, they give out strongly the odour of conia.

*Composition.*—The more important constituents of hemlock are a volatile oil, and an alkaloid termed *conia.* The volatile oil is the odorous, but not the active principle of the plant, as is shown by the fact, that whilst the distilled water, which contains the oil, has the odour of hemlock, it has none of its poisonous properties; and it has been proved that the power of the odour is no measure of the medicinal strength of any specimen of hemlock. *Conia, Coneïn, Conicin,* or *Cicutine* ($C_8NH_{15}$), the active principle of the plant, exists more largely in the fruit than in the leaves, but probably more or less in all parts of the plant. It exists in combination with the coniic acid of Peschier, forming a compound which has not the characteristic odour of the alkaloid, and it requires the presence of an alkali to facilitate its isolation. Conia may be obtained by distilling the soft or syrupy alcoholic extract of the fruit with its own weight of water and a little caustic potash; the conia passes over and floats upon the water. In its pure state it is a light, oily, transparent liquid, with a strong penetrating odour, and an acrid taste. The vapour, when permitted to come in contact with the conjunctiva, causes a flow of tears. Conia may be recognised by its peculiar odour, by being liquid at ordinary temperatures, by its volatility, by its alkaline reaction with turmeric paper, and by giving white fumes of hydrochlorate of conia with the vapour of hydrochloric acid, &c.

CATAPLASMA CONII—HEMLOCK POULTICE.—*Take of hemlock leaf, in powder,* 1 *ounce; linseed meal,* 3 *ounces; boiling water,* 10 *fluid ounces. Mix the hemlock and linseed meal, and add them to the water gradually, with constant stirring.*

EXTRACTUM CONII—EXTRACT OF HEMLOCK.—*Take of the fresh leaves and young branches of hemlock,* 112 *pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to* 130°, *and separate the green colouring matter by a calico filter. Heat the strained liquor to* 200°, *to coagulate the albumen, and again filter. Evaporate the filtrate by a water-bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and, stirring the whole together assiduously, continue the evaporation, at a temperature not exceeding* 140°, *until the extract is of a suitable consistence for forming pills. Dose,* 2 *to* 6 *grs.*

**Pilula Conii Composita**—Compound Pill of Hemlock.

PREPARATION.—*Take of extract of hemlock, 2½ ounces; ipecacuanha, in powder, ½ ounce; treacle, a sufficiency. Mix the extract of hemlock and ipecacuanha, and add sufficient treacle to form a pill-mass. Dose, 5 to 10 grs.*

SUCCUS CONII—JUICE OF HEMLOCK.—*Take of fresh leaves of hemlock, 7 pounds; rectified spirit, a sufficiency. Bruise the hemlock in a stone mortar, press out the juice, and to every three measures of juice add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place. Dose,* ʒss. *to* ℥i. *or more.*

TINCTURA CONII—TINCTURE OF HEMLOCK FRUIT.—Tinctura Conii Fructus.—*Take of hemlock fruit bruised, 2½ ounces; proof spirit, 1 pint. Macerate the hemlock fruit for forty-eight hours, in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 20 *mins. to* ʒii.

### **Vapor Coniæ**—Inhalation of Conia.

PREPARATION.—*Take of extract of hemlock, 60 grains; solution of potash, 1 fluid drachm; distilled water, 10 fluid drachms. Mix. Put twenty minims of the mixture on a sponge, in a suitable apparatus, so that the vapour of hot water passing over it may be inhaled.*

*Therapeutics.*—Conia, the active principle of hemlock, is a most powerful poison, and may be compared in activity with hydrocyanic acid, atropia, and aconitia. Locally, it is an intense irritant. The symptoms which conia induces when given in a dose sufficiently large to act decidedly on the system are, great muscular weakness and languor, with some disorder of vision, giddiness, dilatation of the pupils and ptosis. On trying to walk, he staggers or falls down, and the voice is hoarse from paralysis of the laryngeal muscles. In some these symptoms are preceded by burning pain in mouth, nausea, and vomiting, due to its local irritant action. The intellect is unaffected. In still larger doses it causes essentially the same symptoms, which may terminate in death; and it appears that the more active an individual is in habit and constitution, the less susceptible is he to its action, and it leaves no bad effects after the symptoms pass off. In fatal cases, death takes place from paralysis of the respiratory muscles. In all, the paralysis of the voluntary muscles begins in the lower extremities, next the upper, and soon after the muscles of the trunk, and lastly, those of respiration are affected. Conia is, therefore, a motor depressant if pure, chiefly acting on the end-organs of the motor nerves; but according to some observers the spinal cord is first affected; this discrepancy is, however, explained by the researches of Drs. Fraser and Crum Brown, who have shown that part of the alkaloid is sometimes converted into methyl-conia ($C_9H_{17}N$), and that methyl-conia acts principally on the cord, so that according to the proportion of these two substances present, the symptoms may vary somewhat in the order of their occurrence, but the result will be the same. *Treatment of an over-dose.*—First empty the stomach by stomach-pump or stimulant emetic. No chemical antidote; hence our endeavour must be to maintain respiration by cold affusion, galvanism to upper part of spine and chest walls, ammonia to the nostrils, and hypodermic injection of sulphate of atropine.

Conium, as a medicine, is purely sedative and antispasmodic. It is no true anodyne or hypnotic. It is of great benefit in many cases of undue nervous motor excitability. In order to produce beneficial results, hemlock must in all cases be given in doses sufficient to produce its physiological action. It is recommended by Dr. J. Harley, in the undue excitement of the motor centres frequently accompanying the period of dentition in children; in epilepsy, provided the irritation is central and motor, and not peripheral or emotional, and especially if the disease is traceable to sexual abuse; in convulsive diseases of special muscles; in chorea; in paralysis agitans during its early stage; in nocturnal cramps; in cases of tetanus; in diseases due to spasmodic action of the vagus, such as spasm of the œsophagus, spasmodic contraction of the stomach and œsophagus, spasmodic cough, laryngismus stridulus, hooping-cough, spasmodic asthma; in organic or functional diseases of the cord, attended with excessive irritability of reflex function, as in certain cases of paraplegia, of concussion of the spine, and from the practice of self-abuse in early life; in acute mania, alone with morphia; in inflammatory diseases of the eye; and to retard the progress as well as lessen the pain of cancer. Doubtless much of the discredit that has been attached to the drug has arisen in consequence of the employment of preparations destitute of the active principle, due to the method of preparing them and the volatility of the alkaloid, the officinal preparations, with the exception of the succus being perfectly inert, and it should be given in much larger doses than usually employed, even to children from ʒss. to ℥ii. (HARLEY), or the alkaloid may be employed, dose $\frac{1}{10}$ to $\frac{1}{2}$ gr., but on account of its local irritant action whether given by the mouth or subcutaneously, it should first be neutralised by acetic or sulphuric acid. But it is always necessary to give a dose sufficient to produce sensible physiological effects. In most cases some drooping of the eyelids with relaxation of the orbicularis muscle, giving them a swollen appearance, sluggish movements of the eyeballs, haziness of vision, with giddiness and weakness of the knees, or difficulty of swallowing or of speech, are the indications of moderate coneism (HARLEY), and of a proper effect.

SUMBUL RADIX—Sumbul Root—Musk Root.—The dried transverse sections of the root Euryangium Sumbul. Imported from Russia.

*Characters.*—The pieces are nearly round, from 2½ to 5 inches in diameter, and from ¾ to 1½ inch in thickness. They are covered on the outer edge with a dusky brown rough bark, frequently beset with short, bristly fibres. The interior is porous, and consists of irregular, easily separated fibres. It has a strong odour, resembling that of musk. The taste is at first sweetish, becoming after a time bitterish and balsamic.

### **Tinctura Sumbul**—Tincture of Sumbul.

PREPARATION.—*Take of sumbul root, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the sumbul for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 10 *to* 30 *mins.*

*Therapeutics.*—Sumbul contains a volatile oil, two balsamic resins, wax, starch, &c.; also a crystallizable acid called sumbulic acid. It has been employed as a nervine stimulant, and appears to be allied to valerian in its action. It is also used for the sake of its antispasmodic and composing qualities. It has been given in hysteria, chorea, epilepsy, delirium tremens, low typhoid fevers, chronic pulmonary affections, cholera, &c.

### **CAPRIFOLIACEÆ**—The Honeysuckle Order.—Shrubs or herbs inhabiting the northern parts of Europe, Asia, and America. The plants have astringent, emetic, and purgative properties. Officinal plant: *Sambucus Nigra.*

### **Sambuci Flores**—Elder Flowers.—Officinal plant: *Sambucus nigra*, Linn.; the Common Elder. Officinal part: The fresh flowers, from indigenous plants.

*Botany.*—Arborescent. *Stem*, shrubby, much and always oppositely though irregularly branched. *Leaves*, pinnate; leaflets, two pairs, with an odd one. *Flowers*, white or cream-coloured, in large terminal cymes. *Fruit*, a globular black, three to four-seeded berry. *Habitat*, indigenous.

*Characters.*—Flowers, small, white, fragrant, crowded in large cymes.

**Aqua Sambuci**—ELDER-FLOWER WATER.—PREPARATION.—*Take of fresh elder flowers, separated from the stalks,* 10 *pounds, or an equivalent quantity of the flowers preserved while fresh with common salt; water,* 2 *gallons. Distil one gallon.*

*Dose.*—Of the water, one to fluid ounces.

*Therapeutics.*—The elder is not much used in medicine; the flowers contain a volatile oil, and are somewhat stimulant and slightly diaphoretic; the berries are aperient and diuretic, and the liber or inner bark of the tree is cathartic and emetic. Preparations of the bark have been given in dropsy and in epilepsy. The water is occasionally used as a flavouring vehicle for other remedies, but more commonly as a cosmetic.

**CINCHONACEÆ**—The Cinchona Order.—Trees, shrubs, or herbs, chiefly inhabiting tropical regions. The order is extensive, and furnishes many important products; the plants possess tonic, stimulant, febrifugal, astringent, or emetic properties. Officinal plants: *Cephaëlis Ipecacuanha, Cinchona calisaya, Cinchona Condaminea, Cinchona succirubra, Uncaria Gambir.*

**Ipecacuanha**—Ipecacuan.—Officinal plant: *Cephaëlis Ipecacuanha*, the Ipecacuanha Plant. Officinal part: The root dried; imported from Brazil.

*Characters of Annulated or Brazilian Ipecacuanha.*—In pieces three or four inches long, about the size of a small quill, contorted, and irregularly annulated. Colour, brown of various shades. It consists of two parts, the cortical or active portion, which is brittle, and a slender, tough, white, woody centre, it breaks easily with a resinous fracture. Powder, pale brown, with a faint nauseous odour, and a somewhat acrid and bitter taste.

The principal ingredients of the root are an alkaloid, termed *Emetina* ($C_{30}H_{44}N_2O_8$), or *Emetia, Ipecacuanhic* or *Cephaëlic acid*, volatile oil, fatty matter, &c. *Emetina*, when quite pure, is white, pulverulent, and inodorous, and has a slightly bitter taste; it is soluble in warm water, and readily so in alcohol, but scarcely at all in ether or in oils. It has been proposed as a substitute for ipecacuan, being supposed to possess all the virtues of the officinal preparations. It acts, when pure, in very minute doses, as an emetic, and more or less as a soporific; one-sixteenth of a grain will cause vomiting in an adult man, and two grains have killed a dog.

**Pilula Ipecacuanhæ cum Scilla**—Pill of Ipecacuanha with Squill.

Preparation.—*Take of compound powder of ipecacuanha,* 3 *ounces; squill in powder, ammoniacum in powder, of each,* 1 *ounce; treacle, a sufficiency. Mix the powders, and beat into a mass with the treacle. Dose,* 5 *to* 10 *grains.*

PULVIS IPECACUANHÆ COMPOSITUS—Compound Powder of Ipecacuanha.—Pulvis Ipecacuanhæ cum Opio, 1864—Dover's Powder.—*Take of ipecacuanha, in powder,* ½ *ounce; opium, in powder,* ½ *ounce; sulphate of potash, in powder,* 4 *ounces. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Keep it in a stoppered bottle. Dose,* 5 *to* 15 *grains.*

**Trochisci Ipecacuanhæ**—Lozenges of Ipecacuanha.

Preparation.—*Take of ipecacuanha, in powder,* 180 *grains; refined sugar, in powder,* 25 *ounces; gum acacia, in powder,* 1 *ounce; mucilage of gum acacia,* 2 *fluid ounces; distilled water,* 1 *fluid ounce, or a sufficiency. Mix the powders, and add the mucilage and water to form a proper mass. Divide into* 720 *lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains a quarter of a grain of ipecacuanha. Dose,* 1 *to* 3.

VINUM IPECACUANHÆ—Wine of Ipecacuanha.—*Take of ipecacuanha, bruised,* 1 *ounce; sherry,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation, strain, press, and filter; then add sherry to make one pint. Dose, as an expectorant,* 5 *to* 40 *mins., as an emetic,* ʒss. *to* ℥ss.

*Therapeutics.*—Ipecacuan, in the form of powder, acts as a topical irritant when applied to a sensitive membrane, as is well seen in some persons in whom a violent attack of spasmodic asthma is occasioned by the inhalation of the finer particles. Besides this topical irritant property, ipecacuan acts as a nauseant, emetic, expectorant, diaphoretic, cholagogue, and sedative. When continued in small doses it acts upon the secreting membranes of the bronchi and intestines, especially the mucous membrane of the bronchi, facilitating expectoration. In larger doses it acts as a nauseating emetic, and imparts also a sense of weariness and a tendency to sleep. When circumstances favour it, it acts also as a diaphoretic. As an emetic, ipecacuan is a safe remedy, its effects being neither too depressing nor too long sustained. It is a safe remedy in infantile cases in which emetics are required, as in hooping-cough, in catarrh with difficult expectoration, croup, &c.; and it is likewise useful for adults, especially those of debilitated constitution; for this purpose it is given at the commencement of continued fevers, also to remove irritant matters from the stomach under various circumstances, but its action is slow (20 to 30 minutes), hence in narcotic poisoning, sulphate of zinc or mustard are preferable. Ipecacuanha also increases the intestinal and biliary secretions, and is therefore useful in some cases of dyspepsia and diarrhœa, either alone or in combination with opium. Ipecacuanha is of the greatest value in the cure of acute tropical dysentery, in the treatment of which it is often given in very large doses (25–30 grains), by the mouth, as well as injected into the large intestine by the long tube. The large dose is to be followed by a smaller in about eight hours, provided relief is not obtained. Nausea seldom is distressing as tolerance is generally induced, but it is sometimes advisable to give 15 mins. of laudanum before the ipecacuanha, so as to diminish the irritability of the stomach. In chronic dysentery it is administered in doses of one to three grains thrice a-day, along with opium and mercury. Ipecacuanha was originally introduced into practice by Helvitius as a cure for dysentery, and hence was originally termed Radix Antidysenterica. The powder of ipecacuan and opium is a popular sudorific, and is employed in a variety of cases. Sometimes, given in small doses, it occasions vomiting, and it should not be given when there is much irritability of the stomach. Finely-powdered ipecacuan, made into a liniment with lard and olive oil, and rubbed into the skin, acts as a counter-irritant, producing a vesicular eruption, which, without causing much pain, disappears in the course of two or three days. *Dose*, as an expectorant or purgative, ½ to 2 grains, as an emetic, 10 to 30 grains; children bear large doses.

**Cinchonæ Flavæ Cortex**—Yellow Cinchona Bark.—Officinal plant: *Cinchona Calisaya*, Weddell. Officinal part: The bark; collected in Bolivia and Southern Peru.

**Cinchonæ Pallidæ Cortex**—Pale Cinchona Bark.—Officinal plant: *Cinchona Condaminea*. Officinal part: The bark; collected about Loxa and Ecuador.

**Cinchonæ Rubræ Cortex**—Red Cinchona Bark.—Officinal plant: *Cinchona succirubra*, Pavon. Officinal part: The bark; collected on the western slopes of Chimborazo.

*Botany.*—*Cinchona Calisaya.* A tall tree; *trunk*, straight or bent, naked, frequently twice the thickness of a man's body; the leafy head for the most part elevated above all the other forest trees. *Leaves*, oblong or lanceolate-obovate, obtuse, attenuated at the base, rarely acute on both sides, smooth, polished or pubescent beneath, pitted in the axils of the veins. *Filaments*, usually shorter than one-half the length of the anthers. *Capsule*, ovate, scarcely equal in length to the flower. *Seeds*, frequently fimbriate-denticulate at the margin. Of this species, Weddell has described two varieties, namely, *Calisaya Vera*, which yields the officinal yellow bark, and whose characters are here mentioned; and *Calisaya Josephiana*, a shrub of six to ten feet in height, with a slender branching trunk, erect branches, and leaves rather acute, oblong-lanceolate or ovate-lanceolate. *Habitat*, declivities and steep rugged places of the mountains, at an altitude of from five to six thousand feet, in the hottest forests of the valleys of Bolivia and Southern Peru; between 13° and 16° 30′ south latitude, and from 64° to 70° west longitude; in the Bolivian provinces near La Pax of Enquisivi, Yungas, Larecaja or Sorata, and Canpolican, or Apolobamba; and in the Peruvian province of Carabaya. It flowers in April and May.

Cinchona bark is usually peeled from the trees about the month of May, but it may be taken at any period, except during the rainy season. The natives employed in collecting the bark, who have received the title of *Cascarilleros*, work under the supervision of a *major domo*, and either remove the bark from the tree as it stands, or, what is preferable, they first fell the tree at a short distance above the roots. The bark is then removed either in strips or by accurately incised pieces of from fifteen to twenty inches in length and four to six inches in width, and is carefully brushed. The strong trunk bark is submitted to pressure, which leaves it in flattened pieces, whilst the thinner branch bark is simply exposed to the drying effects of the sun, whereby it is formed into rolls or quills. After it has undergone this process, the bark is picked, the bad being rejected, and the good sewed up in coarse canvas, which receives a supplementary covering of fresh hide when the packages reach the depôts in the town.

**Cinchonæ Flavæ Cortex.**—Yellow, Royal Yellow, or Calisaya Bark.

*Characters.*—In flat pieces, uncoated or deprived of the periderm, rarely in coated quills, from six to eighteen inches long, one to three inches wide, and two to four lines thick, compact and heavy; outer surface brown, marked by broad, shallow, irregular longitudinal depressions; inner surface, tawny-yellow, fibrous; transverse fracture shortly and finely fibrous. Powder, cinnamon-brown, somewhat aromatic, persistently bitter, and should contain at least two per cent. of quinia.

**Cinchonæ Pallidæ Cortex.**—Pale, Crown, or Loxa Bark.

*Characters.*—From half-a-line to a line thick, in single or double quills, which are from six to fifteen inches long, two to eight lines in diameter, brittle, easily splitting longitudinally, and breaking with a short transverse fracture; outer surface brown and wrinkled, or grey, speckled with adherent lichens; with or without numerous transverse cracks; inner surface bright orange or cinnamon-brown; powder, pale brown, slightly bitter, very astringent, and should yield not less than one grain of alkaloids.

**Cinchonæ Rubræ Cortex.**—Red Cinchona Bark.

*Characters.*—In flat or incurved pieces, less frequently in quills, coated with the periderm, varying in length from a few inches to two feet, from one to three inches wide, and two to six lines thick, compact and heavy; outer surface brown or reddish-brown, rarely white from adherent lichens, rugged or wrinkled longitudinally, frequently warty, and crossed by deep transverse cracks; inner surface redder; fractured surface often approaching to brick-red; transverse fracture finely fibrous; powder, red-brown; taste bitter and astringent, and should yield not less than one and a-half grains of alkaloids.

TEST FOR THE PURITY OF CINCHONÆ FLAVÆ CORTEX.—*Boil* 100 *grains of the bark, reduced to very fine powder, for a quarter of an hour in a fluid ounce of distilled water acidulated with ten minims of hydrochloric acid, and allow it to macerate for twenty-four hours. Transfer the whole to a small percolator, and after the fluid has ceased to drop, add at intervals about an ounce and a-half of similarly acidulated water, or until the fluid which passes through is free from colour. Add to the percolated fluid solution of subacetate of lead, until the whole of the colouring matter has been removed, taking care that the fluid remains acid in reaction. Filter, and wash with a little distilled water. To the filtrate add about thirty-five grains of caustic potash, or as much as will cause the precipitate which is at first formed to be nearly redissolved, and afterwards six fluid drachms of pure ether. Then shake briskly, and having removed the ether, repeat the process* *twice, with three fluid drachms of ether, or until a drop of the ether employed leaves, on evaporation, scarcely any perceptible residue. Lastly, evaporate the mixed ethereal solutions in a capsule. The residue, which consists of nearly pure quinia, when dry, should weigh not less than two grains, and should be readily soluble in diluted sulphuric acid.*

TEST FOR THE PURITY OF CINCHONÆ PALLIDÆ CORTEX.—200 *grains of the bark, treated in the manner directed in the test for yellow cinchona bark, with the substitution of chloroform for ether, should yield not less than one grain of alkaloids.*

TEST FOR THE PURITY OF CINCHONÆ RUBRÆ CORTEX.—100 *grains of the bark, treated in the manner directed in the test for yellow cinchona bark, with the substitution of chloroform for ether, should yield not less than one and a-half grain of alkaloids.*

*Composition.*—The cinchona barks contain alkaloids and acids peculiar to the genus cinchona in addition to other substances common to many barks, as tannic acid, starch, resin, colouring matter, oxalate of lime, volatile oil, &c.

The following are the more important constituents of the cinchona barks:—

*Quinia* or *Quinine*, an alkaloid ($C_{20}H_{24}N_2O_2$), exists in largest quantity in the yellow barks, to a much less extent in the red barks, but scarcely at all, or in very small quantity, in the pale barks. In the barks, it is in combination with kinic acid, and the astringent principle termed cincho-tannic acid. It is inodorous, has an intensely bitter taste, and an alkaline reaction. It is almost insoluble in water, requiring four hundred parts of cold, and two hundred or more of boiling water; it is soluble in sixty parts of ether, in two of alcohol or chloroform, in twenty-four of olive oil, also in solutions of the alkalies, carbonate of ammonia, chloride of calcium, &c. Solutions of quinia and its salts exhibit a blue fluorescence, and when to either of them is first added fresh chlorine water, and then ammonia, a splendid emerald-green colour is produced. Quinia possesses the property of left-handed rotatory polarisation. Quinia *per se* is not used in medicine, but its salt, the neutral sulphate, is officinal, being more soluble.

**Quiniæ Sulphas**—Sulphate of Quinia ($(C_{20}H_{24}N_2O_2)_2H_2SO_4$ $7H_2O$)—the sulphate of an alkaliod prepared from yellow cinchona bark, and from the bark of *Cinchona lancifolia*, Mutis.

PREPARATION.—*Take of yellow cinchona bark, in coarse powder, 1 pound; hydrochloric acid, 3 fluid ounces; distilled water, a sufficiency;*

*solution of soda, 4 pints; diluted sulphuric acid, a sufficiency. Dilute the hydrochloric acid with ten pints of the water. Place the cinchona bark in a porcelain basin, and add to it as much of the diluted hydrochloric acid as will render it thoroughly moist. After maceration, with occasional stirring, for twenty-four hours, place the bark in a displacement apparatus, and percolate with the diluted hydrochloric acid until the solution which drops through is nearly destitute of bitter taste. Into this liquid pour the solution of soda, agitate well, let the precipitate completely subside, decant the supernatant fluid, collect the precipitate on a filter, and wash it with cold distilled water until the washings cease to have colour. Transfer the precipitate to a porcelain dish containing a pint of distilled water, and applying to this the heat of a water-bath, gradually add diluted sulphuric acid until very nearly the whole of the precipitate has been dissolved, and a neutral liquid has been obtained. Filter the solution, while hot, through paper, wash the filter with boiling distilled water, concentrate till a film forms on the surface of the solution, and set it aside to crystallise. The crystals should be dried on filtering paper without the application of heat.*

*Characters.*—Filiform, silky, snow-white crystals, of a pure, intensely bitter taste, sparingly soluble in water, yet imparting to it a peculiarly bluish tint. The solution gives with chloride of barium a white precipitate, insoluble in nitric acid, and when treated first with solution of chlorine, and afterwards with ammonia, it becomes of a splendid emerald-green colour.

PURITY TESTS.—*Dissolves in pure sulphuric acid with a feeble yellowish tint, and undergoes no further change of colour when gently warmed. Ten grains, with ten minims of diluted sulphuric acid and half a fluid ounce of water, form a perfect solution, from which ammonia throws down a white precipitate. This redissolves on agitating the whole with half a fluid ounce of ether, without the production of any crystalline matter floating on the lower of the two strata, into which the agitated fluid separates on rest. Twenty-five grains of the salt should lose* 3·6 *grains of water by drying at* 212°.

TINCTURA QUINIÆ—TINCTURE OF QUINIA.—*Take of sulphate of quinia,* 160 *grains; tincture of orange peel,* 1 *pint. Dissolve the sulphate of quinia in the tincture with the aid of a gentle heat; then allow the solution to remain for three days in a closed vessel, shaking it occasionally, and afterwards filter. Dose,* ʒi. *to* ʒii.

TINCTURA QUINIÆ AMMONIATA—AMMONIATED TINCTURE OF QUININE.—*Take of sulphate of quinia,* 160 *grains; solution of ammonia,* 1½ *fluid ounces; proof spirit,* 17½ *fluid ounces. Dissolve* *the sulphate of quinia in the spirit with a gentle heat, and add the solution of ammonia. Dose,* ʒss. *to* ʒii.

PILULA QUINIÆ—PILL OF QUINIA.—*Take of sulphate of quinia,* 60 *grains; confection of hips,* 20 *grains. Mix them to a uniform mass. Dose,* 2 *to* 10 *grains.*

VINUM QUINIÆ—WINE OF QUINIA—Quinine Wine.—*Take of sulphate of quinia,* 20 *grains; citric acid,* 30 *grains; orange wine,* 1 *pint. Dissolve, first the citric acid, and then the sulphate of quinia, in the wine; allow the solution to remain for three days in a closed vessel, shaking it occasionally; and afterwards filter. Dose,* ℥ss. *to* ℥i.

*Quinidia,* an alkaloid, isomeric with quinia ($C_{20}H_{24}N_2O_2$), is met with in most of the true cinchona barks. It crystallizes in hard, anhydrous, colourless prisms, which are inodorous, but have a bitter taste. In many of its characters it resembles quinia, but is much less soluble in water and in ether, though its sulphate is more soluble in water than the sulphate of quinia, and it possesses right-handed polarisation. With the chlorine-water and ammonia test it gives an emerald-green colour, and its solutions exhibit a blue fluorescence; it may be recognised by a solution of the sulphate giving a precipitate with solution of iodide of potassium.

*Cinchonia.*—An alkaloid ($C_{20}H_{24}N_2O$), may be obtained probably from all the true cinchonia barks. It crystallizes in four-sided prisms, which are anhydrous, colourless, inodorous, and of somewhat bitter taste. It resembles quinia in many of its characters, but may be distinguished from it by being soluble in ether, by possessing right-handed polarisation, and giving a white precipitate on the addition, first, of fresh chlorine water, and then ammonia; whereas quinia gives a rich emerald-green colour. The sulphate and hydrochlorate of cinchonia are occasionally employed medicinally.

*Cinchonidia,* an alkaloid isomeric with cinchona ($C_{20}H_{24}N_2O$), possesses left-handed polarisation, but does not give the emerald-green colour with the chlorine and ammonia test.

*Quinoidine.*—Amorphous Quinia is the name given to a substance which is found in the mother-liquor after the preparation of sulphate of quinia. By the addition of an alkaline carbonate to the mother-liquor, a light-brownish precipitate is produced, which, when washed and carefully dried by a gentle heat, assumes a resinous appearance. It is uncrystallizable, and is generally called *quinoidine,* a name which was first applied by Sertuërner to amorphous quinia itself;

but Liebig has ascertained that the so-called quinoidine is a compound of amorphous quinia with various inert substances.

*Quinic*, or *Kinic Acid* ($C_7H_{12}O_6$), crystallizes in oblique rhombic prisms, resembling tartaric acid in appearance. It is soluble in water, somewhat in alcohol, but sparingly in ether. It exists in the barks probably in combination with the alkaloids.

*Cincho-tannic Acid* ($C_{14}H_{12}O_7H_2O$), differs from ordinary tannic acid chiefly in the following points :—In precipitating the persalts of iron *green*, in the somewhat greater solubility of its salts, and in the property which it possesses of absorbing oxygen, whereby it is converted into an insoluble red substance, which is known as

*Cincho-fulvic Acid*, *Red Cinchonic*, or *Cinchona Red* ($C_{12}H_{14}O_7$).—This substance, as its name implies, is of a red colour. It is almost insoluble in water, but is somewhat soluble in alcohol and in ether. It is readily soluble in alkalies, giving the solution a deep-red colour, and is the colouring principle of most of the cinchona barks. It is believed to be produced by the oxidation of cincho-tannic acid.

*Kinovic Acid* ($C_{24}H_{38}O_4$).—It is insoluble in water, but is soluble in alcohol and in ether. It occurs in many of the cinchona barks, and may be recognised by its solutions giving a green precipitate with copper, and by solutions of its alkaline salts giving precipitates with acetate of lead and chloride of mercury.

DECOCTUM CINCHONÆ FLAVÆ—DECOCTION OF YELLOW CINCHONA.—*Take of yellow cinchona bark, in coarse powder,* 1¼ *ounce; distilled water,* 1 *pint. Boil for ten minutes in a covered vessel. Strain the decoction when cold, and pour as much distilled water over the contents of the strainer as will make the strained product measure one pint. Dose,* ℥i. *to* ℥ii.

EXTRACTUM CINCHONÆ FLAVÆ LIQUIDUM—LIQUID EXTRACT OF YELLOW CINCHONA.—*Take of yellow cinchona bark, in coarse powder,* 1 *pound; distilled water, a sufficiency; rectified spirit,* 1 *fluid ounce. Marcerate the cinchona bark in two pints of water for twenty-four hours, stirring frequently; then pack in a percolator, and add more water, until twelve pints have been collected, or until the water ceases to dissolve anything more. Evaporate the liquor at a temperature not exceeding* 160° *to a pint; then filter through paper, and continue the evaporation to three fluid ounces, or until the specific gravity of the liquid is* 1·200. *When cold, add the spirit gradually, constantly stirring. The specific gravity should be about* 1·100. *Dose,* 10 *minims to* ʒi.

INFUSUM CINCHONÆ FLAVÆ—INFUSION OF YELLOW CINCHONA.—*Take of yellow cinchona bark, in coarse powder, ½ ounce; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel for two hours, and strain. Dose,* ℥i. *to* ℥ii.

TINCTURA CINCHONÆ FLAVÆ—TINCTURE OF YELLOW CINCHONA.—*Take of yellow cinchona bark, in moderately fine powder, 4 ounces; proof spirit, 1 pint. Macerate the cinchona bark for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒii.

TINCTURA CINCHONÆ COMPOSITA—COMPOUND TINCTURE OF CINCHONA.—*Take of pale cinchona bark, in moderately fine powder, 2 ounces; bitter orange peel, cut small and bruised, 1 ounce; serpentary root, bruised, ½ ounce; saffron, 60 grains; cochineal, in powder, 30 grains; proof spirit, 1 pint. Macerate the cinchona bark and the other solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒii.

*Therapeutics.*—The chief difference between the action of cinchona and its alkaloids lies in the astringency of the former, which is due to the presence of cincho-tannic acid. As tonics, these preparations are given in small doses, and are employed in cases of debility, especially when this condition is produced or attended by profuse discharges, such as colliquative sweating or diarrhœa, which, by their astringency, they are frequently capable of arresting, or by other mucous or purulent discharges, such as leucorrhœa, abscesses, &c. They are useful in cases of physical exhaustion, whether produced by chronic disease or as met with in convalescence from acute attacks, provided there be not febrile, inflammatory, or active hemorrhagic symptoms, and no great irritability of the stomach or bowels. As antiperiodics, the cinchona preparations are much less frequently employed than the alkaloids, in consequence of the bulk in which they must be given, and the disagreeable topical irritant effects which they produce; for this purpose quinine, as a rule, possesses all the qualifications, with none of the disadvantages, of the barks. But on the alkaloids alone depend the antiperiodic and febrifuge properties of the bark, and as they are identical in action, differing only in degree, and quinine being the most powerful, it may be taken as their type in considering their physiological action, more especially as it is officinal. *Locally*, quinine and its salts are irritants, in small doses, frequently repeated, causing gastric catarrh ; in large doses, nausea, vomiting, or diarrhœa. They are also antiseptic, preventing or averting putrefaction and fermentation.

*Internally* quinia and its preparations act as tonics and antiperiodics, but have not the astringent properties of the barks. Sulphate of quinia, or quinine, is more extensively employed than any other of the preparations of cinchona, as a tonic, antiperiodic, and febrifuge, and excepting astringency and aromatic flavour, it possesses all the valuable properties of the barks themselves, with the additional great advantage of being equally potent in smaller doses. When given in large doses, or in moderate doses long continued, quinine gives rise to symptoms to which the name cinchonism, or quininism, has been applied. The more prominent of these symptoms are—dulness of hearing; giddiness; singing, hissing, or buzzing in the ears; fulness, tension, and pain in the head; flashes of light across the eyes, and nausea. If the dose be larger, or repeated, the cerebral symptoms are more completely developed ; there is vertigo, a staggering gait, the difficulty of hearing is increased ; there may be perverted vision or total blindness, the face flushed, the fulness in the head may be relieved by epistaxis, and delirium and coma may ensue in extreme cases. After tonic doses, death appears to result from paralysis of the heart and respiratory centres. Occasionally a scarlet eruption, followed by desquamation, has been noticed after the administration of quinine, due probably to idiosyncrasy, and in elderly people it sometimes causes irritability of the bladder and kidneys.

These effects are due to a local irritant action on stomach, intestines, and kidneys, to its increasing the frequency of pulse and arterial tension in small doses, and diminishing them in large doses ; while the cerebral symptoms are due either to a direct action on the nerve cells (HARLEY), or to its action on the heart, causing partial anæmia of the brain (BINZ). It diminishes reflex excitability. It is also antipyretic in fevers, a large dose—10 to 20 grains—lowering the temperature from 1° to 4° Far. It is also antitriptic, diminishing the metamorphosis of tissue, as shown by the diminution in the amount of urea and uric acid eliminated by the kidneys.

The most important, however, of its actions is the power it has over malarial fever, both as a prophylactic and curative agent. To explain this action various theories have been advanced. Thus M. Piorry, in 1846, asserted that quinine arrested a paroxysm of malarial fever by an action on the spleen, diminishing its size, &c. This idea is, however, erroneous, because the splenic enlargement is not the cause of the fever paroxysm, but a result; besides, quinine does not appreciably diminish the enlarged organ when given in these cases. Then Binz brought forward his theory of its action on the blood corpuscles, and inferred that quinine acted as a chemical antidote to the malarial poison. This theory of Binz's has been disputed, however by Dr. Moinet (*Ed. Med. Jour.*, 1878), who has strongly advocated his opinion that quinine is not a chemical but a physiological antidote, which latter theory explains much more satisfactorily the varied effect of quinine in different cases, and why it is not always equally powerful, and why it requires to be so frequently repeated, &c., facts which are quite inexplicable by Binz's theory. But for the full argument, see Dr. Moinet's paper. *As a prophylactic,* the dose is three grains given in the morning in a little coffee; and if the district is very unhealthy, the same dose may be given in the evening.

*As a curative agent* it is in the simple and uncomplicated forms of intermittent fevers that quinine and the cinchona preparations are most serviceable; and it is only after visceral disease, or other complications, when present, have been suitably treated by other remedies, that these remedies can be safely or profitably applied. In remittent fevers they are less efficacious. In other *regularly-recurring* disorders, such as neuralgia, tic-douloureux, headache, and many others, the cinchonas and quinine are useful; but in diseases which attack the patient at uncertain intervals, such as epilepsy, &c., they are rarely of service. Of late years quinine has come into pretty general use in the treatment of continued and other fevers, especially in typhoid and rheumatic fevers, when great pyrexia is present; under such conditions, it has been proved to exert a decidedly lowering effect on the temperature without materially influencing the general course of the fever. To be effectual the dose needs to be very large. Dr. Clifford Albut has administered it in doses ranging from twenty to sixty grains, or more, every six hours. It has also been extensively tried in fevers of septic origin, such as puerperal fever. But the balance of evidence seems to allow it no true antiseptic powers, but simply an antipyretic action, and even that, according to Landau, who tried it freely in this class of diseases, is only of a very temporary nature. In malignant scarlatina, small-pox, erysipelas, in typhoid pneumonia, in dysentery, in hectic, in gangrene, in carbuncle, and many other rapidly-exhausting diseases, these preparations are indicated. In certain cachectic conditions, as in secondary syphilis, in scrofulous eye affections and skin disease, in conjunction with other remedies, quinine or the barks are often of essential service. In enlargement of the spleen, in tetanus, and many other disorders, these remedies are employed, especially if they are of malarious origin.

Cinchonia and its salts and quinidia and its salts possess medicinal properties similar to those of quinia and its salts, and may be employed in the same circumstances. Cinchonia salts are usually considered to be only about two-thirds as efficacious as those of quinia, so that, for the same effect, they required to be administered in proportionately larger doses. Cinchonidine probably possesses properties similar to those of cinchonia, but is less powerful. *Administration.*—In intermittent fever, the dose and time of administration depend on the severity of the attack. In mild cases give first a mercurial purge, then 10 grs. at least five hours before the expected paroxysm, and the same dose in the sweating stage. If the case is very severe, give a larger dose, 20 to 40 grs. at once, and do not wait for intermissives, and you may combine it with a little morphia to counteract its cerebral effects, and the cure is frequently expedited by giving arsenic in the intervals of the paroxysm.

Quinine may be given by the stomach, rectum, or subcutaneously.

As a nervine tonic 1 to 3 grs. in pill or solution with dilute sulphuric or hydrobromic acid, and tinct. aurantii. As an antiperiodic, 10 to 60 grs. given in coffee or milk, or in bolus with chocolate.

For hypodermic injection a solution of the hydrochlorate or hydrobromate is preferable, as they are more soluble than the sulphate, and less irritating locally.

*Sulphate of Quinia,* one to three grains as a tonic; three to ten, twenty, or even more, as an antiperiodic. It may be given in pill, in mixture (dissolved by the addition of a little sulphuric acid), or in confection. As an antiperiodic, quinine may be given either in divided doses during the intermission, or in one full dose in anticipation of the paroxysm. The stomach and bowels should be prepared for its reception (or for the preparation of bark) by an emetic or purgative; and if the stomach should steadfastly resist the dose, it may be administered as an enema or endermically.

**Catechu Pallidum**—Pale Catechu.—Officinal plant: *Uncaria Gambir.* Officinal part: An extract of the leaves and young shoots; prepared at Singapore and in the Eastern Archipelago.

*Characters.*—It occurs in cubical pieces about an inch in diameter, porous in texture; of a reddish-brown colour externally, and yellow internally; taste bitter and astringent.

Catechu consists chiefly of a variety of tannic acid, 40 to 60 per cent. called catechu-tannic acid, and distinguished from gallo-tannic acid by giving a green precipitate with persalts of iron. Catechine or catechuic acid, mucilage, and soluble matter. Catechine or catechuic acid may be obtained as a white, light powder, constituted of silky acicular crystals. The purity of catechu can only be ascertained by estimating the quantity of tannic and catechuic acids present.

INFUSUM CATECHU—Infusion of Catechu.—*Take of pale catechu, in coarse powder,* 160 *grains; cinnamon bark, bruised,* 30 *grains; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for half-an-hour, and strain. Dose,* 1 *to* 2 *oz.*

PULVIS CATECHU COMPOSITUS—Compound Powder of Catechu.—*Take of pale catechu, in powder,* 4 *ounces; kino, in powder, rhatany root, in powder, of each* 2 *ounces; cinnamon bark, in powder, nutmeg, in powder, of each,* 1 *ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Keep it in a stoppered bottle. Dose,* 20 *to* 60 *grs.*

TINCTURA CATECHU—Tincture of Catechu.—*Take of pale catechu, in coarse powder,* 2½ *ounces; cinnamon bark, bruised,* 1 *ounce; proof spirit,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation; strain, press, filter, and add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ʒii.

TROCHISCI CATECHU—Catechu Lozenges.—*Take of pale catechu, in powder,* 720 *grains; refined sugar, in powder,* 25 *ounces; gum acacia, in powder,* 1 *ounce; mucilage of gum acacia,* 2 *fluid ounces; distilled water, a sufficiency. Mix the catechu, sugar, and gum, and add the mucilage and water to form a proper mass. Divide into* 720 *lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains one grain of catechu.*

*Therapeutics.*—Catechu, when pure, acts as a more powerful astringent than kino. It is used as an astringent in chronic non-inflammatory diarrhœa and dysentery in combination with chalk and opiates. As a stomachic it is sometimes found to be serviceable in dyspepsia when chewed before meals. In passive uterine hemorrhages, and in mucous discharges from any of the mucous membranes, catechu is usefully employed. It is chewed or taken in the form of the lozenge as an application to relaxed throats, to obviate hoarseness in public speakers and singers, and in ulcers of the mouth. As a topical astringent it is applied externally to ulcers, sore nipples, &c.

**VALERIANACEÆ**—The Valerian Order.—Herbs, inhabiting the temperate climates of Europe, Asia, and America. The plants possess stimulant, antispasmodic, and tonic properties, due to the presence of a strong-scented volatile oil. Officinal plant: *Valeriana officinalis.*

**Valerianæ Radix**—Valerian.—Officinal plant: *Valeriana officinalis,* Linn.; Common Valerian (wild or cultivated). Officinal part: The root of plants indigenous to and also cultivated in Britain, collected in autumn and dried; that from wild plants growing on dry soil being preferred.

*Botany.* — Herbaceous. *Root-stock,* perennial, tuberous, with numerous root-fibres from two to six inches long. *Stem,* solitary, two to four feet high, furrowed, smooth. *Leaves,* all pinnate; leaflets, seven to ten pairs, lanceolate-dentate, terminal leaflet little, if at all, larger than the others. *Inflorescence,* a corymb, becoming somewhat panicled. *Flowers,* whitish or flesh coloured. *Fruit,* smooth, compressed, one-celled, and one-seeded. *Habitat,* indigenous, commonly growing in ditches and damp places, but occasionally in dry and elevated situations.

*Characters.*—A short, yellowish-white rhizome, with numerous fibrous roots about two or three inches long; of a bitter taste and penetrating odour, agreeable in the recent root, becoming fetid by keeping; yielding volatile oil and valerianic acid when distilled with water.

The root owes its activity to the *volatile oil* which is of greenish colour, and consists of a crystallizable oily principle, termed *valerole,* and a hydro carbon, resembling the oil of Borneo camphor, termed *bornéene* and *Valerianic acid,* which is an oily fluid, of specific gravity 0·9, has a strong odour of valerian, and forms salts with bases. This acid may be prepared by the oxidation of fousel oil, the hydrated oxide of amyle. (See the process for the preparation of Valerianate of Soda, p. 72.)

INFUSUM VALERIANÆ—Infusion of Valerian.—*Take of valerian, bruised,* 120 *grains; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* ℥i. *to* ℥ii.

TINCTURA VALERIANÆ—Tincture of Valerian.—*Take of valerian root, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the valerian root for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the precolation with the remaining five ounces of spirit. Afterwards subject the con-*

*tents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose, ʒss. to ʒii.*

**TINCTURA VALERIANÆ AMMONIATA — AMMONIATED TINCTURE OF VALERIAN.**—*Take of valerian root, in coarse powder, 2½ ounces; aromatic spirit of ammonia, 1 pint. Macerate for seven days in a well-closed vessel, with occasional agitation; then strain, press, filter, and add sufficient aromatic spirit of ammonia to make one pint. Dose, ʒss. to ʒi.*

*Therapeutics.*—Valerian acts as a stimulating antispasmodic, acting upon the brain in large doses, causing vertigo, headache, loss of vision, and reducing reflex excitability. It is useful in purely nervous cases, especially when these are complicated with hysteria. It has been recommended in typhoid fever, in typhoid pneumonia, in hysteria, diabetes, in neuralgia, in insanity, in epilepsy, &c.

**COMPOSITÆ**—The Composite Order.—Herbs or shrubs universally distributed. The properties of the composite plant are various, most of them being more or less bitter; they may be stimulant, carminative, tonic, narcotic, laxative, anthelmintic, &c. Officinal plants: An undetermined species of *Artemisia*, *Anthemis nobilis*, *Taraxacum Dens Leonis*, *Arnica montana*, *Anacyclus Pyrethrum*, *Lactuca Virosa.*

**Santonica**—Santonica.—Officinal plant: An undetermined species of *Artemisia*, Linn. Officinal part: The unexpanded flower-heads; imported from Russia. Santonica, known also as *Semen sanctum*, *Semen santonica*, *Semen contra*, *Semen cynæ*, *Artemisia santonica*, wormseed, &c., has long been employed as a vermifuge.

*Characters.*—Flower-heads rather more than a line in length, and nearly half-a-line in breadth, fusiform, blunt at each end, pale, greenish-brown, smooth; resembling seeds in appearance, but consisting of imbricated involucral scales, with a green midrib, enclosing four or five tabular flowers; odour, strong; taste, bitter; camphoraceous.

**Santoninum**—Santonin ($C_{15}H_{18}O_3$).—A crystalline neutral principle, obtained from Santonica.

*Characters.*—Colourless, flat, rhombic prisms, feebly bitter, fusible and sublimable by a moderate heat; scarcely soluble in cold water, sparingly in boiling water, but abundantly in chloroform, and in boiling rectified spirit, fatty oils and solutions of the fixed alkalies forming with the latter definite chemical compounds. It becomes yellow by exposure to light. According to Hesse, it is not a neutral principle, but an acid.

*Therapeutics.*—Santonin, as well as santonica or wormseed, which is seldom used, acts as an anthelmintic, and is said to be especially useful in the treatment of the round worm (*Ascaris lumbricoides*). In over-doses, it is apt to produce nausea, vomiting, and severe tenesmus. A yellow or green discoloration of vision occasionally results from its use, which soon passes off, after the drug is discontinued. *Dose,* 1 to 6 or 8 grains in powder, with sugar of milk or calomel, or in form of a lozenge, the dose to be repeated two or three times on alternate nights, followed by a purgative of senna or castor oil in the morning.

**Anthemidis Flores**—Chamomile Flowers.—Officinal plant: *Anthemis nobilis,* Linn. Common Chamomile. Officinal parts: 1. The flower-heads, single and double, dried; wild and cultivated. 2. *Oleum Anthemidis,* Oil of Chamomile, the oil distilled in Britain from Chamomile flowers.

*Botany.*—*Root,* perennial, with long fibres. *Stems,* herbaceous, procumbent in the wild state; erect when cultivated, much branched, round, furrowed, hollow, eight inches to a foot in length. *Leaves,* doubly pinnate, sessile, somewhat downy; leaflets, linear, subulate, acute. *Flower-heads,* terennial, solitary, with a yellow convex disk, and white reflexed or spreading rays. *Habitat,* indigenous; cultivated at Mitcham and elsewhere.

*Characters of the Flowers.*—The single variety consists of both yellow, tubular, and white strap-shaped florets; the double, of white strap-shaped florets only; all arising from a conical scaly receptacle; both varieties, but especially the single, are bitter and very aromatic.

*Characters of the Oil.*—Pale-blue or greenish-blue, but gradually becoming yellow; with the peculiar odour and aromatic taste of the flowers. *Dose,* 2 to 5 mins.

The single flowers yield most volatile oil, and are to be preferred to the double flowers for medicinal purposes; besides this oil, the flowers contain bitter extractive tannin, &c.

EXTRACTUM ANTHEMIDIS—EXTRACT OF CHAMOMILE.—*Take of chamomile flowers,* 1 *pound; oil of chamomile,* 15 *minims; distilled water,* 1 *gallon. Boil the chamomile with the water until the volume is reduced to one-half, then strain, press, and filter. Evaporate the liquor by a water-bath until the extract is of a suitable consistence for* *forming pills, adding the oil of chamomile at the end of the proces Dose,* 2 *to* 10 *grs.*

INFUSUM ANTHEMIDIS—INFUSION OF CHAMOMILE.—*Take o chamomile flowers,* ½ *ounce; boiling distilled water,* 10 *fluid ounce Infuse in a covered vessel for fifteen minutes, and strain. Dos* 1 *to* 2 *oz.*

*Therapeutics.*—Chamomile acts as an aromatic bitter tonic, and wa formerly also esteemed as a febrifuge. It is chiefly used in the presen day as a domestic medicine for the treatment of simple atonic dyspepsia; the extract is a useful adjunct to purgative medicines in form o pill. A strong tepid infusion is sometimes given to promote th action of emetics; the infusion is also used externally as a fomentation to relieve pain and swelling.

**Taraxaci Radix**—Dandelion Root.—Officinal plant: *Taraxacum Dens Leonis,* D.C.; Common Dandelion. Officinal parts: The fresh roots, gathered, between September and February, from meadows and pastures in Britain.

*Botany.*—Herbaceous, perennial. *Root,* spindle-shaped, smooth, dark-brown externally, white within. *Leaves,* radical, runcinate, broad, dentate, glabrous, bright shining green. *Scape,* simple, erect, with a single head of flowers of a golden-yellow colour. *Fruit,* yellow, somewhat compressed. *Habitat,* indigenous, in fields and waste places.

*Characters.*—Tap-shaped roots, smooth and dark-brown externally, white within, easily broken, and giving out an inodorous, bitter, milky juice, which becomes pale-brown by exposure. The roots are to be gathered between September and February, at which period the juice is thick, bitter, and yields a large amount of extract. Besides other constituents, the juice contains a bitter principle termed *Taraxacin,* which is soluble in water and in alcohol, and on which the activity of its preparation depends.

SUCCUS TARAXACI—JUICE OF TARAXACUM.—*Take of fresh dandelion root,* 7 *pounds; rectified spirit, a sufficiency. Bruise the dandelion root in a stone mortar; press out the juice; and to every three measures of juice add one of the spirit. Set aside for seven days, and filter. Keep it in a cool place. Dose,* ʒi. *to* ʒii.

DECOCTUM TARAXACI—DECOCTION OF DANDELION.—*Take of dried dandelion root, sliced and bruised,* 1 *ounce; distilled water,* 1 *pint. Boil for ten minutes in a covered vessel, then strain, and pour as much* *distilled water over the contents of the strainer as will make the strained product measure a pint. Dose,* 1 *to* 2 *oz.*

EXTRACTUM TARAXACI—Extract of Dandelion.—*Take of fresh dandelion root,* 4 *pounds. Crush the root; press out the juice, and allow it to deposit; heat the clear liquor to* 212°, *and maintain the temperature for ten minutes; then strain, and evaporate by a water-bath at a temperature not exceeding* 160°, *until the extract has acquired a suitable consistence for forming pills. Dose,* 10 *to* 20 *grs.*

*Therapeutics.*—Taraxacum in moderate doses acts as a tonic and stomachic. It is useful in dyspepsia and other secondary diseases resulting from derangement of the biliary organs. But it has no action on the liver, either direct or indirect, nor is it a diuretic, as Dr. Moinet has shown that although the succus in large doses did increase the urinary secretion to a slight extent, the increase was due solely to the rectified spirit contained in the succus, as its equivalent, minus the taraxacum, increased the urine to the same extent in the same individual, while the extract had no such action.

**Arnicæ Radix**—Arnica Root.—Officinal plant: *Arnica Montana,* Linn.; Mountain Arnica. Officinal part: The dried rhizome and rootlets; collected in middle and southern Europe.

*Characters.*—Rhizome from one to three inches long, and two or three lines thick, cylindrical, contorted, rough from the scars of the coriaceous leaves, and furnished with numerous long slender fibres; has a peppery taste and peculiar odour.

The flowers, and occasionally the leaves, of arnica are used in medicine, as well as the rhizome. Besides other constituents, the plants contain a resin, a volatile oil, and an alkaloid termed *Arnicina.*

TINCTURA ARNICÆ—Tincture of Arnica.—*Take of arnica root, in coarse powder,* 1 *ounce; rectified spirit,* 1 *pint. Macerate the arnica for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose,* ʒss. *to* ʒi.

*Therapeutics.*—Arnica acts in over-doses as an acro-narcotic, producing a burning sensation in the throat, nausea, vomiting, purging, vertigo, &c. In medicinal doses it has been classed with stimulants, diaphoretics, narcotics, and in its external application, with sedatives and deobstruents. It is highly esteemed in some parts of the Continent, but has not met with the same acceptance in this country, although it has been lauded by homœopathists. As an internal remedy it has been recommended in adynamic fevers and asthenic inflammations, in paralytic and nervous affections, in amaurosis, in chronic rheumatism, and in other cases in which debility and inactivity are remarkable, its use being contra-indicated in cases in which there is a tendency to sthenic inflammation, internal congestion, or hemorrhage. Externally, it is extensively employed as an application to sprains, bruises, ecchymoses, &c., and has received the significant appellation of *Panacea lapsorum*. It may be applied in the form of cataplasm or lotion. But it requires to be used with caution, as it produces sometimes an eczematous or erysipelatous inflammation, which (PHILLIP) is said to be avoided by using an aqueous infusion or decoction instead of the alcoholic tincture.

PYRETHRI RADIX—PELLITORY ROOT.—The root of Anacyclus Pyrethrum *De Cand.*, imported from the Levant.

*Characters.*—In pieces about the length and thickness of the little finger, covered with a thick brown bark, studded with black shining points. Breaks with a resinous fracture, and presents internally a radiated structure. When chewed it excites a prickling sensation in the lips and tongue, and a glowing heat.

TINCTURA PYRETHRI—TINCTURE OF PELLITORY.—*Take of pellitory root, in coarse powder, 4 ounces; rectified spirit, 1 pint. Macerate the pellitory for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.*

*Therapeutics.*—The tincture is not used internally, but diluted in about seven parts of water; it is employed by dentists as a wash for the mouth. Pellitory acts as a powerful local irritant and stimulant, causing a profuse flow of saliva when chewed. It is used as a masticatory in toothache, tic-douloureux, paralysis of the tongue, rheumatic affections of the jaws, relaxation of the uvula, &c. Thirty to sixty grains of the root may be chewed at one time as a masticatory.

LACTUCA—LETTUCE.—The flowering herb of *lactuca virosa*, Linn. The strong-scented lettuce. Officinal preparation: *Extractum Lactucæ.*

*Botany.*—*Stem*, erect, round, marked with blood-red spots. *Leaves*, horizontal, obtuse, arrow-shaped at the base. *Root*, tap-shaped. The herb attains a height of two to four feet, has yellow flowers, larger than those of the common garden lettuce, and the entire plant is filled with a fetid milky juice. It is an indigenous biennial, flowers in August and September, and is found abundantly in the hedgerows.

The juice of the leaves in the flowering season has a strong opiate odour and a bitter taste; it has an acid reaction, and contains lactucin, an odorous principle, lactucerin, albumen, extractive, resin, and some salts. When exposed to the atmosphere it turns first yellow and then brown, and ultimately solidifies into lactucarium. This variety of lettuce is more distinctly narcotic than the other, but still only to a comparatively slight extent.

*Lactucarium*, called also *Lettuce Opium*, is the inspissated juice of both varieties of lettuce, *L. virosa* being generally preferred. Lettuce opium is usually met with in small lumps, seldom larger than a pea or bean, irregular in shape, friable, reddish-brown, sometimes covered with an ash-grey efflorescence, has somewhat the odour of opium, and a bitter taste. The variety obtained from *L. sativa* is often met with in larger pieces, occasionally weighing several ounces. Lactucarium acts as a sedative, anodyne, hypnotic, and antispasmodic, operating as a direct sedative of the circulatory system without any previous acceleration. It may be used as a substitute for opium in cases in which the objections to that drug are insuperable. The great drawback to the use of lactucarium is the uncertainty of its action. It may be given in doses of three, five, ten, or more grains.

EXTRACTUM LACTUCÆ—EXTRACT OF LETTUCE.—*Take of the flowering herb of lettuce*, 112 *pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to* 130°, *and separate the green colouring matter by a calico filter. Heat the strained liquor to* 200° *to coagulate the albumen, and again filter. Evaporate the filtrate by a water-bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and stirring the whole together assiduously, continue the evaporation, at a temperature not exceeding* 140°, *until the extract is of a suitable consistence for forming pills. Dose*, 5 *to* 30 *grains.*

*Therapeutics.*—This extract, though differing from lactucarium, probably possesses its medicinal virtues, at least to a considerable degree. Like lactucarium, it is given as a soporific in cases in which opium disagrees, more especially in the fatiguing cough of bronchitis.

**LOBELIACEÆ**—The Lobelia Order—Lactescent herbs or shrubs, inhabiting tropical and sub-tropical climates. The plants generally contain an acro-narcotic milky juice, and are frequently poisonous. Officinal plant: *Lobelia inflata.*

**Lobelia**—Lobelia.—Officinal plant: *Lobelia inflata,* Linn.; Indian Tobacco. Officinal part: The herb in flower, dried; imported from North America.

*Characters.*—Stem, angular; leaves, alternate, ovate, toothed, somewhat hairy beneath; capsule, ovoid, inflated, ten-ribbed; herb, acrid. Usually in compressed rectangular parcels.

The plant yields a milky juice when punctured in any part; but the root and the inflated capsule possess the medicinal properties to the greatest extent. It is usually met with in compressed square cakes, is of a pale greenish-looking colour, has a disagreeable odour, and a burning acrid taste. The chief constituents of the plants are *Lobelina,* a liquid alkaloid to which the narcotic properties are probably due; *Lobelic acid,* an acrid resin, and volatile oil.

TINCTURA LOBELIÆ—TINCTURE OF LOBELIA.—*Take of lobelia, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the lobelia for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 10 *to* 30 *mins.*

TINCTURA LOBELIÆ ÆTHEREA—ETHEREAL TINCTURE OF LOBELIA.—*Take of lobelia, in coarse powder,* 2½ *ounces; spirit of ether,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation; then strain, press, filter, and add sufficient spirit of ether to make one pint. Dose,* 10 *to* 30 *mins.*

*Therapeutics.*—Lobelia acts in small doses as a sedative, diaphoretic, and expectorant; in larger doses, as an effectual nauseating, depressing emetic, hence sometimes called *Emetic Weed.* In over-doses the nausea and vomiting are very distressing; purging also attends its action in these cases, and extreme depression ensues, preceded by headache, vertigo, and muscular tremors. In excessive doses it acts as an acro-narcotic poison, the symptoms already mentioned are more fully developed, and death is not unfrequently preceded by convulsions. Lobelia is chiefly employed in spasmodic asthma, hooping-cough, &c., and in those cases in which tobacco, which it resembles in effect, though it does not act so powerfully, has been recommended.

It should, however, only be given at the commencement of the attack, as it is of no use in the interval, but it soon loses effect by repetition. It has been given as an emetic in croup and other cases, but its nauseating and depressing effects are too powerful and too long-continued to admit of safe use in children's complaints; and, indeed, in any case its action must be carefully watched, as it occasionally causes dangerous symptoms of depression of the heart's action. *Treatment*, stimulants, and if there is much gastro-intestinal irritation, opium and demulcents.

**STYRACACEÆ.**—Trees and shrubs, chiefly inhabiting tropical and subtropical regions. The plants possess bitter, aromatic, or stimulant properties. Officinal plant: *Styrax Benzoin.* It is convenient to place here also *Liquidambar orientale* of the natural order Altingiaceæ or Balsamifluæ, the Liquidambar order, the plants of which are natives of the warmer parts of India and America, and some of which are also found in the Levant.

**Benzoinum**—Benzoin. Officinal plant: *Styrax Benzoin*; the Benzoin Tree. Officinal part: A resinous exudation from the stem; imported from Siam and Sumatra.

*Characters.*—In lumps, consisting of agglutinated tears, or of a brownish mottled mass, with or without white tears imbedded in it; has little taste, but an agreeable odour; gives off, when heated, fumes of benzoic acid; and is soluble in rectified spirit and in solution of potash. It consists chiefly of resin, benzoic acid, and other minor ingredients, with a trace of volatile oil.

TINCTURA BENZOINI COMPOSITA—COMPOUND TINCTURE OF BENZOIN.—*Take of benzoin, in coarse powder,* 2 *ounces; prepared storax,* 1½ *ounce; balsam of tolu,* ½ *ounce; socotrine aloes,* 160 *grains; rectified spirit,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation, then filter, and add sufficient rectified spirit, if required, to make one pint. Dose,* ʒss. *to* ʒi.

*Therapeutics.*—Benzoin acts in the same manner as the other true balsams, but is more apt to cause irritation of the stomach and bowels in susceptible persons. It is used as a stimulating expectorant, and as a very slight tonic in chronic pulmonary disorders; but in consequence of its stimulating properties it is contra-indicated in acute cases. It is occasionally used by fumigation in affections of the throat, as in chronic laryngitis. The compound tincture is sometimes applied as a stimulant to flabby ulcers, and also to freshly incised wounds; in the latter case it should not be applied to the raw surface of the wound, but to the outer surface, after the edges have been carefully placed in apposition, otherwise it would prevent healing by the first intention; its effect is merely the mechanical one of excluding the air. Benzoin enters into various kinds of fumigating pastilles used in sick rooms to overcome unpleasant odours, a mischievous practice, unless the unpleasant odour be merely of a temporary character, and its cause recognised. Benzoin possesses also the power of diminishing greatly the tendency of fats to become rancid, a property of which advantage in taken in the preparation of Adeps Benzoatus.

**Acidum Benzoicum**—Benzoic acid.—An acid ($HC_7H_5O_2$) obtained from benzoin by sublimation.

*Characters.*—In light, feathery, crystalline plates and needles, which are flexible, nearly colourless, and have an agreeable aromatic odour, resembling that of benzoin. It is sparingly soluble in water, but is readily dissolved by rectified spirit; soluble also in solutions of the caustic alkalies and of lime, and it is precipitated from these on the addition of hydrochloric acid, unless the solution be very dilute. It melts at 248°, and boils at 462°.

*Therapeutics.*—Benzoic acid acts as a topical irritant, causing heat and acridity of the mouth and fauces when swallowed, and a sensation of heat in the stomach. It acts generally as a stimulant, especially of mucous membranes. It passes out of the system by the urine in the form of hippuric acid. It is very rarely used alone, but it is occasionally given as a stimulating expectorant in chronic bronchial affections, and chronic affections of the genito-urinary mucous membrane, but as the benzoate of ammonia is more soluble it is generally preferred. *Dose,* 10 to 30 grs.

**Styrax Præparatus**—Prepared Storax.—Officinal plant: *Liquidambar orientale.* Officinal part: A balsam, obtained from the bark in Asia Minor, purified by means of rectified spirit and straining.

*Characters.*—A semi-transparent, brownish yellow, semi-fluid resin, of the consistence of thick honey, with a strong agreeable fragrance and aromatic bland taste. Heated in test-tube on the vapour-bath, it becomes more liquid, but gives off no moisture; boiled with solution of bichromate of potash and sulphuric acid, it evolves the odour of hydride of benzoyle.

Its chief constituents are a volatile oil (Styrole, $C_8H_8$), which is colourless, and exceedingly volatile; a crystallizable substance (Styracine); two resins, hard and soft; and cinnamic acid. *Cinnamic*

*Acid* ($HC_9H_7O_2$), exists also in the balsams of Peru and Tolu, and in the resin of xanthorrhœa, as well as in liquid storax, and is formed also by the oxidation of oil of cinnamon. It is a colourless, crystalline acid, with a feebly aromatic and acrid taste. It resembles benzoic acid, but may be distinguished from it by affording oil of bitter almonds when treated with an oxidising agent. Like benzoic acid, it passes out of the system by the urine in the form of hippuric acid.

*Therapeutics.*—Storax acts as a stimulant, especially of the respiratory mucous membrane, and, like the other true balsams, may be used as a stimulating expectorant. *Dose*, 10 to 20 grs.

**ERICACEÆ**—The Heath Order.—Officinal plant: *Arctostaphylos Uva Ursi.*

**Uvæ Ursi Folia**—Bearberry Leaves.—Officinal plant: *Arctostaphylos Uva Ursi;* The Bearberry. (*Arbutus Uva Ursi.*) Officinal part: The dried leaves from indigenous plants.

*Botany.*—A small, evergreen, procumbent shrub. *Stem*, woody, round, and trailing. *Leaves*, coriaceous, alternate, stalked, evergreen, obovate, entire shining, upper surface dark-green, under surface paler and reticulated. *Flowers*, in small terminal racemes; corolla rose-coloured. *Fruit*, a globose scarlet berry, having a sharp, astringent taste, and containing rarely more than four or five fully developed, more or less cohering, seeds. *Habitat*, indigenous; rugged, stony districts of Europe, Asia, and America.

*Characters.*—Obovate, entire, coriaceous, shining leaves, about three-fourths of an inch in length, reticulated beneath; with a strong, astringent taste, and a feeble hay-like odour when powdered; the infusion giving a bluish-black precipitate with perchloride of iron.

The dried leaves are dark shining green, inodorous, but have a bitter astringent taste, and are reticulated on their under surface. The leaves of the Red Whortleberry (*Vaccinium Vitis Idæa*) are apt to be substituted for the true leaves. They are known by their serrated margin and dotted under surface. The leaves of Uva Ursi contain tannic and gallic acids, a neutral crystallizable substance termed *Arbutin*, resin, volatile oil, extractive, and two substances named respectively *Ursin* and *Urzone.*

INFUSUM UVÆ URSI.—INFUSION OF BEARBERRY.—*Take of bearberry leaves, bruised,* ½ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for two hours, and strain through calico. Dose,* 1 *to* 2 *ounces.*

*Therapeutics.*—Uva ursi, in consequence of the tannic and gallic acids contained in the leaves, acts as a pure vegetable astringent. It acts also as a diuretic, at the same time modifying the condition of the urine. Its uses are the same as those of vegetable astringents generally, but it is especially applicable to diseases of the urinary passages of a chronic character, in which there is a more or less profuse mucous discharge, unaccompanied by any active inflammatory symptoms. In *catarrhus vesicæ*, and in certain calculous affections, some writers have observed great benefit from its use, whilst with others it has often completely failed.

**SAPOTACEÆ.**—Trees or shrubs, often with milky juice, chiefly inhabiting the tropics. Officinal plant: *Isonandra gutta.*

**Gutta Percha.**—The concrete juice of Isonandra gutta.

*Characters and Tests.*—In tough flexible pieces, of a light brown or chocolate colour. Soluble or nearly soluble in chloroform, yielding a more or less turbid solution.

Gutta-percha of commerce is composed of gutta-percha proper, a peculiar substance, of the nature of a hydrocarbon,—a little vegetable acid, caseine, and two resins, one of which is soluble in ether and in oil of turpentine, the other in alcohol.

LIQUOR GUTTA-PERCHA—SOLUTION OF GUTTA-PERCHA.—*Take of gutta-percha, in thin slices,* 1 *ounce; chloroform,* 8 *fluid ounces; carbonate of lead, in fine powder,* 1 *ounce. Add the gutta-percha to* 6 *fluid ounces of the chloroform in a stoppered bottle, and shake them together frequently, until solution has been effected. Then add the carbonate of lead, previously mixed with the remainder of the chloroform, and having several times shaken the whole together, set the mixture aside, and let it remain at rest until the insoluble matter has subsided. Lastly, decant the clear liquid, and keep it in a well-stoppered bottle.*

*Therapeutics.*—This solution is used in the preparation of charta sinapis. It may also be used as a dressing for wounds, by painting the solution over the part, the chloroform quickly evaporates, leaving a film of gutta-percha, which, while it excludes the air, retains the edges of the wound in apposition. Gutta-percha muslin has now almost entirely substituted oil-silk as an adjunct to surgical dressings. This is useful also to protect the fingers of the surgeon against infectious discharges, to protect a tender portion of skin against an irritating secretion or discharge, &c. Gutta-percha is also used to aid in retaining the parts in position in fractures of the lower jaw, &c. It is easily moulded into the required shape, and retains the parts with great firmness.

**OLEACEÆ**—The Olive Order.—Trees or shrubs inhabiting temperate climates. The plants of the order possess emollient, laxative, bitter, tonic, or febrifugal properties. Officinal plants: *Olea europæa, Fraxinus Ornus, Fraxinus rotundifolia.*

**Oleum Olivæ**—Olive oil.—Officinal plant: *Olea europæa*, Linn.; The European Olive. Officinal part: The oil, expressed from the fruit in the south of Europe.

*Characters of Olive Oil.*—Pale yellow, with scarcely any odour, and a bland oleaginous taste; congeals partially at about 36°.

Olive oil is obtained from the fruit by expression. At first the olives, before they are quite ripe, are merely bruised with a very gentle pressure, and the oil then collected is the finest, or *virgin oil.* Boiling water and greater pressure is next resorted to, and the ordinary oil is obtained. Olive oil is a fatty, fixed, or expressed oil, having a yellowish colour, scarcely any odour, and a bland oleaginous taste. It is somewhat soluble in ether, in alcohol, and in the fixed oils, but not in water. It is not, like linseed oil, a drying oil, but becomes rancid by exposure to the atmosphere, through the absorption of oxygen. At moderately low temperatures it divides into two portions, the one fluid and transparent, *Elaine* or *Oleine*, the other solid, termed *Margarine*, which has a white pearly aspect; the former constitutes about seventy-two, the latter about twenty-eight per cent. of the oil. Oleine and Margarine consist respectively of oleic acid and margaric acid, in combination with a base, glyceryl ($C_3H_5$), of which glycerine is the hydrate.

*Therapeutics.*—In doses of one fluid ounce or thereabouts, olive oil acts as a gentle painless laxative. It is but little used internally; but as a laxative, may be either given by the stomach or added to enemata. It is an ingredient of the officinal *Enema Magnesiæ Sulphatis, charta Epispastica, Cataplasma Lini*, and of several ointments, liniments, and plasters. As an emollient, it acts mechanically as an antidote in cases of irritant poisoning. Externally, it may be applied as a simple emollient. Two kinds of soap are made with olive oil, *sapo durus* and *sapo mollis*, both of which are officinal; it is also one of the sources of glycerine.

**Sapo Animalis**—Curd Soap.—A soap made with soda and a purified animal fat, consisting principally of stearin.

*Characters.*—White, or with a very light greyish tint, dry; nearly inodorous; horny and pulverisable when kept in dry warm air; easily moulded when heated.

**Sapo Durus**—Hard Soap.—Soap made with olive oil and soda.

*Characters.*—Greyish-white, dry, inodorous; horny and pulverisable when kept in dry warm air; easily moulded when heated.

Hard, Spanish, or Castile soap consists of oleic and margaric acids, in union with soda. The mottled kind is coloured by the addition of sulphate of iron, which, on exposure to the air, is converted into red peroxide of iron.

**Sapo Mollis**—Soft Soap.—Soap made with olive oil and potash.

*Characters.*—Yellowish-green, inodorous, of a gelatinous consistence.

EMPLASTRUM SAPONIS—SOAP PLASTER.—*Take of hard soap, 6 ounces; lead plaster, 2½ pounds; resin, 1 ounce. To the lead plaster, melted by a gentle heat, add the soap and resin, first liquefied; then, constantly strirring, evaporate to a proper consistence.*

LINIMENTUM SAPONIS—LINIMENT OF SOAP.—*Take of hard soap, cut small, 2½ ounces; camphor, 1¼ ounce; oil of rosemary, 3 fluid drachms; rectified spirit, 18 fluid ounces; distilled water, 2 fluid ounces. Mix the water with the spirit, and add the oil of rosemary, the soap, and the camphor. Macerate for seven days at a temperature not exceeding* 70°, *with occasional agitation, and filter.*

*Therapeutics.*—Soap acts internally as an antacid, in the manner of the alkalies, but more mildly. It is seldom given alone, but is a useful adjunct to purgative medicines, of which it is an excellent excipient, rendering them more soluble, and therefore more speedy, and less irritant in their action. Externally, soap acts as a detergent and discutient. Soap liniment (*Opodeldoc*) is applied with friction to bruises, sprains, rheumatic pains, &c., and forms one-half by volume of Linimentum Opii. Soap plaster is employed as a discutient, and also to give mechanical support to weak parts. Soap is used also as an antidote in cases of poisoning by the mineral acids; it may be given in strong solution. Dissolved in water, it is also employed as an enema in habitual constipation, or to facilitate the action of purgatives.

**Glycerinum**—Glycerine.—A sweet principle ($C_3H_8O_3$) obtained from fats and fixed oils, and containing a small percentage of water.

*Characters.*—A clear colourless fluid, oily to the touch, without odour, of a sweet taste ; freely soluble in water and in alcohol. When decomposed by heat, it evolves intensely irritating vapours. *Sp. gr.*, 1·25.

Glycerine is the hydrate of glyceryl the salifiable base of oil, and is made by decomposing palm oil into its fatty acid and glycerine by steam.

*Therapeutics.*—Glycerine acts as an emollient and nutrient. It is, besides, an excellent solvent, and is possessed of considerable antiseptic powers. Its solvent and antiseptic properties are utilised in the preparations introduced for the first time into the second edition of the "British Pharmacopœia," under the term glycerines. These are five in number—Glycerine of borax, of tannin, of gallic acid, of carbolic acid, and of starch. Glycerine, by itself, is chiefly used externally as an emollient application to chaps, sores, and skin diseases ; and when added in small proportions to lotions and poultices, it renders them more soothing and emollient, and keeps the parts longer moist. It is used as an emollient application to the ear, and also to soften the hard dry tongue of fever. It is sometimes given as a substitute for cod-liver oil, in cases in which the objections to the latter are insuperable, but it is of incomparably less value. When so administered, it is given in doses of from one drachm to half-an-ounce. It is also frequently administered internally as an emollient in bronchial catarrh with irritating cough. Latterly it has come into use in the treatment of diabetes. The indication it then fulfils is, that it affords the patient the gratification of its sweet taste, whilst it does not tend to glycosuria. Some excellent results are recorded of this mode of treatment. In others it entirely fails.

**Manna**—Manna.—Officinal plants : *Fraxinus Ornus*, Linn., and *Fraxinus rotundifolia*, D.C.; the European Flowering or Manna Ash, and the Round-leaved Flowering or Manna Ash. Officinal part : A concrete saccharine exudation from the stem, obtained by incisions ; imported from Calabria and Sicily.

*Characters.*—In stalactiform pieces from one to six inches in length, and one or two inches in width, uneven, porous, and friable, curved on one side, of a yellowish-white colour, with a faintly nauseous odour, and a sweetish taste. It consists principally of mannite ($C_3H_7O_3$), together with common sugar and extractive matter. The mannite, which forms from 60 to 80 per cent. of the manna, may be extracted by means of boiling rectified spirit, from which it will afterwards separate on cooling in colourless, shining crystals. It requires five parts of cold water for its solution, and this does not undergo vinous fermentation in contact with yeast.

*Dose.*—Sixty grains to one ounce.

*Therapeutics.*—Manna acts as a laxative, and in large doses is apt to produce griping and flatulence. It is chiefly used, for the sake of its sweet taste, to flavour other medicines for children.

**ASCLEPIADACEÆ**—The Milkweed Order.—Officinal plant: *Hemidesmus indicus.*

**Hemidesmi Radix**—Hemidesmus Root.—Officinal plant: *Hemidesmus indicus*, D.C. Officinal part: The root, dried; imported from India.

*Characters.*—Yellowish-brown, cylindrical, tortuous, furrowed, and with annular cracks, having a fragrant odour, and a very agreeable flavour.

SYRUPUS HEMIDESMI—SYRUP OF HEMIDESMUS.—*Take of hemidesmus root, bruised,* 4 *ounces; refined sugar,* 28 *ounces; boiling distilled water,* 1 *pint. Infuse the hemidesmus in the water, in a covered vessel, for four hours, and strain. Set it by till the sediment subsides; then decant the clear liquor, add the sugar, and dissolve by means of a gentle heat. The product should weigh two pounds ten ounces, and should have the specific gravity* 1·335.

*Dose.*—Of the syrup, one or two fluid drachms.

*Therapeutics.*—Hemidesmus is esteemed in India as an alterative, diaphoretic, and tonic, and is employed as a substitute for sarsaparilla; but in this country it is used chiefly as a flavouring adjunct.

**LOGANIACEÆ**—The Strychnia Order.—Shrubs, herbs, or trees, chiefly inhabiting tropical regions. The plants possess highly poisonous properties, producing tetanic spasm. Officinal plant: *Strychnos Nux vomica.*

**Nux Vomica**—Nux Vomica.—Officinal plant: *Strychnos Nux vomica*, Linn. Officinal part: The seeds; imported from the East Indies.

*Characters of the Seeds.*—Nearly circular and flat, about an inch in diameter, umbilicated and slightly convex on one side, externally of an ash-grey colour, thickly covered with short satiny hairs, internally translucent, tough and horny, taste intensely bitter, inodorous. The seeds are difficult to powder; the powder is of a greyish-yellow colour. The bark of nux vomica has been substituted by mistake for angustura bark; the distinguishing characters are mentioned at page 211. The chief constituents of the seeds are two alkaloids, *strychnia* and *brucia*, and an acid, *strychnic* or *igasuric* acid, together with gum, wax, colouring matter, bassorin, &c.

*Brucia* ($C_{23}H_{26}N_2O_4$).—It crystallizes with four equivalents of water, is soluble in alcohol, much more soluble in water than strychnia, and its taste is very bitter. Nitric acid gives a bright red colour with brucia; it is changed into a violet colour by the addition of protochloride of tin, and so is distinguished from morphia. And it does not give the test with the bichromate of potash like strychnia.

*Strychnic* or *Igasuric Acid* exists in nux vomica in union with the alkaloids; it is crystallizable, is soluble in water and in alcohol, and gives at first a green colour, and ultimately a green precipitate with salts of copper.

**Strychnia**—Strychnia.—An alkaloid ($C_{21}H_{22}N_2O_2$), obtained from nux vomica.

PREPARATION.—*Take of nux vomica,* 1 *pound; acetate of lead,* 180 *grains; solution of ammonia, a sufficiency; rectified spirit, a sufficiency; distilled water, a sufficiency. Subject the nux vomica for two hours to steam in any convenient vessel; chop or slice it; dry it in a water-bath or hot-air chamber, and immediately grind it in a coffee-mill. Digest the powder at a gentle heat for twelve hours with two pints of the spirit and one of the water, strain through linen, express strongly, and repeat the process twice. Distil off the spirit from the mixed fluid, evaporate the watery residue to about sixteen ounces, and filter when cold. Add now the acetate of lead, previously dissolved in distilled water, so long as it occasions any precipitate; filter; wash the precipitate with ten ounces of cold water, adding the washings to the filtrate; evaporate the clear fluid to eight ounces, and when it has cooled add the ammonia in slight excess, stirring thoroughly. Let the mixture stand at the ordinary temperature for twelve hours; collect the precipitate on a filter, wash it once with a few ounces of cold distilled water, dry it in a water-bath or hot-air chamber, and boil it with successive portions of rectified spirit, till the fluid scarcely tastes bitter. Distil off most of the spirit, evaporate the residue to the bulk of about half-an-ounce, and set it aside to cool. Cautiously pour off the yellowish mother-liquor (which contains the brucia of the seeds) from the white crust of strychnia which adheres to the vessel; throw the crust on a paper filter; wash it with a mixture of two parts of rectified spirit and one of water, till the washings cease to become red on the addition of nitric acid; finally, dissolve it by boiling it with an ounce of rectified spirit, and set it aside to crystallize. More crystals may be obtained by evaporating the mother-liquor.*

*Characters.*—In right square octahedrons or prisms, colourless and inodorous ; sparingly soluble in water, but communicating to it its intensely bitter taste ; soluble in boiling rectified spirit and in chloroform, but not in absolute alcohol or in ether. Pure sulphuric acid forms with it a colourless solution, which, on the addition of bichromate of potash, acquires an intensely violet hue, speedily passing through red to yellow. Not coloured by nitric or sulphuric acid; leaves no ash when burned with free access of air. A very active poison.

Strychnia crystallizes in white, lustrous octahedra, or in four-sided prisms, but it is also met with in the form of a granular powder. It is inodorous, but intensely bitter. Cold water dissolves only about one seven-thousandth part of strychnia, but nevertheless, is rendered distinctly bitter by it. It is soluble in about 2500 parts of boiling water. Strychnia is insoluble in the caustic alkalies, but is soluble in the essential oils. It is fusible, but not volatile ; it decomposes at a low temperature. It reacts as an alkali. In addition to its physiological properties, strychnia may be recognised by the following chemical tests :—Terchloride of gold gives a reddish-yellow precipitate. Bichloride of platinum gives a yellow granular precipitate. Infusion of galls gives a white precipitate. When dissolved in hydrochloric acid, corrosive sublimate gives a white clotty precipitate. Pure sulphuric acid forms a colourless solution, but on the addition of bichromate of potash a beautiful violet tint is produced, which, passing through red, ultimately becomes brownish-yellow. With perfectly pure strychnia nitric acid does not give a red colour, but with the strychnia of commerce it usually does so, in consequence of the presence of brucia and yellow colouring matter. Strychnia is frequently adulterated. Its purity may be known by the above tests. The sulphate, nitrate, and hydrochlorate of strychnia are soluble in water, and more readily so in the presence of free acid.

LIQUOR STRYCHNIÆ—SOLUTION OF STRYCHNIA.—*Take of strychnia, in crystals,* 4 *grains ; diluted hydrochloric acid,* 6 *minims ; rectified spirit,* 2 *fluid drachms ; distilled water,* 6 *fluid drachms. Mix the hydrochloric acid with four drachms of the water, and dissolve the strychnia in the mixture by the aid of heat ; then add the spirit and the remainder of the water. Dose,* 5 *to* 10 *mins.*

EXTRACTUM NUCIS VOMICÆ—TINCTURE OF NUX VOMICA. —*Take of nux vomica,* 1 *pound ; rectified spirit, a sufficiency. Apply steam to the nux vomica until it is thoroughly softened, then dry rapidly,* *and reduce to fine powder. Exhaust the powder by boiling it with successive portions of the spirit until the latter comes off nearly free from bitterness. Strain, distil off the spirit, and evaporate by a water-bath to the consistence of a soft extract. Dose,* ¼ *to 2 grs.*

TINCTURA NUCIS VOMICÆ—TINCTURE OF NUX VOMICA.—*Take of nux vomica, 2 ounces; rectified spirit, 1 pint. Apply steam to the nux vomica until it is thoroughly softened, then dry rapidly, and reduce it to fine powder. Macerate the powder for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards, subject the contents of the percolater to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose, 5 to 20 mins.*

*Therapeutics.*—Nux vomica and its preparations, when given in small medicinal doses, repeated at regular intervals, act as tonics by a local action on the gastric mucous membrane, as well as by a constitutional action on the nervous system, the digestive powers and appetite are increased and the action of the bowels is stimulated. They also exercise a special stimulant action upon the medulla oblongata and spinal cord, producing spasmodic action of the voluntary muscles, without, as a rule, even in large doses, affecting the sensorium. In larger doses, they act more distinctly upon the spinal cord, and also somewhat as topical irritants; the stomach is disordered, the spirits are depressed, the patient becomes exceedingly sensitive to external impressions, complains of weariness, and sometimes a sense of creeping in his limbs, which sometimes tremble and sometimes feel stiff; he has some difficulty in maintaining the upright position, and not unfrequently staggers in his gait. Convulsive spasms of the muscles from the most trivial impressions ensue if the drug be continued, and most of the muscles are implicated. At the same time, if any part of the body be paralysed, twitchings, which increase in frequency and power, may be observed in the paralysed muscles. In still larger doses, these symptoms are intensified and regular tetanic convulsions occur, until death occurs from asphyxia. Professor Christison mentions a case in which death ensued in fifteen minutes after taking the poison; but more commonly the fatal result occurs between one and ten or twelve hours afterwards. Much depends upon the habits of the patient with respect to the drug, and the condition of the stomach with respect to food, as to the effects to be produced, and the period of their manifestation.

Nux vomica and its preparations, besides being employed in the treatment of paralysis, which will be mentioned with strychnia, are used in a variety of cases, chiefly as stomachics and tonics. They are given in affections of the stomach, such as atonic dyspepsia, pyrosis, gastrodynia, the vomiting of pregnancy, &c.; in affections of the bowels, such as diarrhœa, dysentery, painter's colic, flatulence, &c., forming an excellent adjunct to purgative pills used in flatulent constipation due to an *atonic* state of the bowels; in prolapsus of the rectum, in incontinence of urine, in chlorosis, hypochondriasis, amenorrhœa, neuralgia, in amaurosis, chorea, epilepsy, and many other conditions.

Strychnia and its salts act for the most part like nux vomica. When taken in poisonous doses, the symptoms which ensue are more or less as follows:—If taken in solution, it has an intensely bitter taste. After a certain interval, often without any warning, the victim suddenly feels a sense of suffocation, and the muscles of the head and limbs, if not of the entire body, are affected with tremblings and twitchings. In a little while longer tetanic convulsions seize almost the entire frame, and the body becomes rigidly fixed, with the head bent backwards, the body also arched backwards (opisthotonos), the hands clenched, the soles of the feet incurved, the face congested, and the expression of the countenance, caused by the spasmodic contraction of the muscles, that of the *sardonic grin*. There is heat and dryness of the fauces, and sometimes frothing at the mouth, with fixity of the jaws, and an anxious feeling of impending suffocation. The intellect is generally but little, or not at all, affected during the intermissions; on the contrary, the external senses are usually exceedingly acute. The fits last from half-a-minute to two or more minutes, and recur at shorter and shorter intervals, and are longer continued towards the end. In the intervals the person feels exhausted, and terribly anxious; he generally knows when a paroxysm is coming on, and cries out either to be held, or that he will die. Very slight causes, such as the closing of a door, the rattling of articles upon the table, or lightly touching him, may produce a paroxysm. Death either takes place by asphyxia during a paroxysm, or by exhaustion in the interval. These symptoms somewhat resemble those of tetanus, but the history, mode of onset, and rapid development are generally sufficient to distinguish them. In strychnic poisoning the muscles of the jaw are last affected, and after a convulsion there is complete relaxation. In tetanus the reverse is the rule. One-sixteenth of a grain of strychnia, according to Dr. Christison, killed a child, between two and three years of age, in four hours; and Dr. Warner, U.S., died in fourteen minutes, from the effects of half-a-grain of sulphate of strychnia. Half-a-grain of strychnia would be a dangerous dose for an adult, although some persons have recovered after taking three or more grains, and doses have frequently been increased to a grain without producing marked results. The period at which the symptoms supervene varies, but the effects of a poisonous dose are usually observed within from five to twenty minutes after taking it, and in fatal cases, death generally occurs within two hours. Strychnia is thus a powerfully convulsant poison, and the convulsions are spinal, due to its stimulant action on the motor cells of the spinal cord, *i.e.*, an excited motor. It paralyses the motor efferent nerves and increases arterial pressure. Its action on the digestive canal is purely local. But it is astonishing to find, as has been lately discovered by the admirable experiments of Professor Crum Brown and Dr. T. R. Fraser, that its methyl and ethyl compounds, while retaining most of their chemical properties, have their physiological actions completely changed, so that, instead of producing tetanic convulsions, like strychnia, they induce a condition of general paralysis of the body by paralysing the extremities of the motor nerves. These experimenters have also proved that the same is true of at least two other convulsant poisons—viz., brucia and thebaia. The change of physiological action is so absolute that Drs. Brown and Fraser recommend the methyl and ethyl compounds of these poisons as antidotes in cases of poisoning with them. The substances experimented with were the iodide of methyl-strychnium, the sulphate of methyl-strychnium, and the nitrate and hydrochlorate of that base; also the iodide and sulphate of methyl-brucium, and the iodide and sulphate of methyl-thebaium.

Strychnia is employed in the cases already mentioned under nux vomica, but it is more commonly used in paralysis. Unless it be employed judiciously, strychnia may produce evil rather than good effects, for it is not in all cases of paralysis that its exhibition is indicated. It should not be given in cases in which the paralysis is due to an inflammatory condition of the brain or spinal cord, nor in those in which it is the consequence of the pressure of effused blood; and in those cases in which the paralysis is due to organic lesion of the nervous centres, it often does harm rather than good. It is not until inflammatory symptoms in the one case, and the effused blood in the other, have been removed, that strychnia produces its good effects in the removal of the paralysis, which is still apt to remain. It is more serviceable in general paralysis, and in paraplegia, than in hemiplegia; but it often proves beneficial in the paralysis of certain organs, as of the bladder, the sphincter ani, and other parts, and in such cases it is sometimes better to apply it near the part, endermically or hypodermically, than to give it internally. It is useful in the treatment of local palsy, the result of lead or mercurial poisoning, or of rheumatism, or diphtheria, and in those cases also its topical action is often to be preferred. It is useless, however, if the paralysis has existed so long that the muscles have undergone fatty degeneration, so that they no longer respond to a slowly interrupted galvanic current. In amaurosis, applied endermically, it is sometimes of advantage. In muscular tremors, nervous exhaustion, impotence, and other cases mentioned under nux vomica, strychnia may be cautiously tried.

*The Dose of Strychnia.*—$\frac{1}{30}$ cautiously increased to $\frac{1}{8}$ of a grain, given in pill with bread crumb or confection of roses, the alkaloid being first dissolved in a drop of rectified spirit or weak acid, so as to ensure its equal distribution throughout the pill mass. For hypodermic use its dose is $\frac{1}{80}$ grain, and it should be injected into the substance of the paralysed muscle. The dose of its salts is the same, and for hypodermic use the sulphate may be preferred as it is more soluble.

*Treatment of an over-dose.*—Emetic or stomach-pump. No satisfactory chemical antidote. Tannic acid, iodine, or one of its salts form compounds which are not permanent, but may delay its absorption until an emetic be given.

*Physiological antidote.*—Chloral hydrate given in large doses 30 to 40 grains, either alone or with potassium bromide, and repeated in a dose according to the effects produced. Chloroform or ether inhalation and artificial respiration, to diminish the severity of the convulsions and save the patient's strength and ward off asphyxia.

**GENTIANACEÆ**—The Gentian Order.—Herbs, rarely shrubs, universally distributed. The plants are usually bitter; some have emetic and narcotic properties. Officinal plants: *Gentiana lutea*, *Ophelia Chirata.*

**Gentianæ Radix**—Gentian Root.—Officinal plant: *Gentiana lutea*, Linn.; Yellow Gentian. Officinal part: The root, dried; collected in the Alps, Apennines, and other mountainous districts of Europe.

*Characters of the Root.*—From half-an-inch to one inch in thickness, several inches in length, often twisted, much wrinkled, or marked with close transverse rings; brown externally, yellow within, tough and spongy; taste at first sweetish, afterwards very bitter.

The root contains, besides other constituents, a volatile oil, a crystallizable, neutral, bitter principle, gentio-pecrine or gentian bitter ($C_{20}H_{30}O_{12}$), a glucoside crystalline, bitter, soluble in water and spirit and the active principle, and gentianic acid, crystalline and inert.

EXTRACTUM GENTIANÆ—Extract of Gentian.—*Take of gentian root, sliced, 1 pound; boiling distilled water, 1 gallon. Infuse the gentian in the water for two hours; boil for fifteen minutes; pour off, press, and strain. Then evaporate the liquor by a water-bath until the extract is of a suitable consistence for forming pills. Dose, 5 to 30 grains.*

INFUSUM GENTIANÆ COMPOSITUM—Compound Infusion of Gentian.—*Take of gentian root, sliced, bitter orange peel, cut small, of each, 60 grains; fresh lemon peel, cut small, ½ ounce; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose, 1 to 2 ounces.*

MISTURA GENTIANÆ—Gentian Mixture.—Infusum Gentianæ Compositum, 1864.—*Take of gentian root, sliced, ½ ounce; bitter orange peel, cut small; coriander fruit, bruised, of each, 30 grains; proof spirit, 2 fluid ounces; distilled water, 8 fluid ounces. Macerate the gentian, orange peel, and coriander in the proof spirit for two hours, then add the water, macerate again for two hours, and strain through calico. Dose, ℥ss. to ℥i.*

TINCTURA GENTIANÆ COMPOSITA—Compound Tincture of Gentian.—*Take of gentian root, cut small and bruised, 1½ ounce; bitter orange peel, cut small and bruised, ¾ ounce; cardamom seeds, freed from the pericarps and bruised, ½ ounce; proof spirit, 1 pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose, ʒss. to ʒii.*

*Therapeutics.*—Gentian acts as a purely bitter tonic. It is useful in atonic dyspepsia with acidity, and in a variety of cases associated with nervous debility, and inactivity of the digestive system, as in convalescence from acute diseases, fevers, &c., in dyspepsia, from abuse of tea, from sedentary habits and mental or bodily exhaustion, &c., along with alkalies. It is also somewhat anthelmintic, and in over-doses may act as a nauseant and laxative.

**Chirata**—Chiretta.—Officinal plants: *Ophelia Chirata*, D.C.; the Chiretta or Chirayta. Officinal part: The entire plant; collected in Northern India when the fruit begins to form.

*Characters.*—Stems, about three feet long, of the thickness of a goose-quill, round, smooth, pale-brown, branched; branches, opposite; flowers, small, numerous, panicled; the whole plant intensely bitter.

The plant has a disagreeable, bitter, non-astringent taste. It contains, with other constituents, a resin, and a yellow colouring matter, chiratin, a crystalline bitter principle, and ophelic acid.

INFUSUM CHIRATÆ—INFUSION OF CHIRETTA.—*Take of chiretta, cut small, ½ ounce; distilled water at* 120° *degrees*, 10 *fluid ounces. Infuse in a covered vessel for half-an-hour, and strain. Dose*, ℥ss. *to* ℥ii.

TINCTURA CHIRATÆ—TINCTURE OF CHIRETTA.—*Take of chiretta, cut small and bruised*, 2½ *ounces; proof spirit*, 1 *pint. Macerate the chiretta for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose*, ʒss. *to* ʒii.

*Therapeutics.*—Chiretta acts as a bitter non-astringent tonic and stomachic. It is used in the same cases as gentian, to which it is closely allied in its medicinal properties.

**CONVOLVULACEÆ**—The Convolvulus Order.—Herbs or Shrubs, usually twining, chiefly inhabiting the tropics. The plants generally possess purgative properties. Officinal plants: *Convolvulus Scammonia Exogonium Purga.*

**Scammonium**—Scammony.—Officinal plant: *Convolvulus Scammonia*, Linn.; Officinal parts:—1. *Scammonii Radix.* The dried root; from Syria and Asia Minor. 2. *Scammonium*, Scammony; a gum-resin, obtained by incision from the living root in Syria. 3. *Scammoniæ Resina*, Resin of Scammony; a resin, obtained by means of rectified spirit from scammony root or scammony.

*Characters of the Root.*—Tap-shaped roots, sometimes three inches in diameter at the top, brown without, white within, slightly odorous, but tasteless. Ether agitated with the powder, and evaporated, leaves a residue having the properties of scammony resin.

*Characters of the Gum-Resin.*—It occurs in pieces irregular in shape and size, ash-grey and rough externally; fresh fracture resinous, splintery, shining, black when dry; odour and flavour, cheesy; causes when chewed a slight prickly sensation in the back of the throat; easily triturated into a dirty-grey powder, and converted with water into a smooth emulsion. It does not effervesce with hydrochloric acid. Boiling water agitated with the powder, cooled, and filtered, does not strike a blue colour with tincture of iodine. Ether removes from 80 to 90 per cent. of resin; and what remains is chiefly soluble gum, with a little moisture.

PREPARATION OF THE RESIN.—*Take of scammony root, in coarse powder,* 8 *ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Digest the scammony root with sixteen fluid ounces of the spirit in a covered vessel, at a gentle heat, for twenty-four hours; then transfer to a percolator, and when the tincture ceases to pass, add more spirit, and let it percolate slowly until the root is exhausted. Add to the tincture four fluid ounces of the water, and distil off the spirit by a water-bath. Remove the residue while hot to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin, wash this several times with hot water, and dry it on a porcelain plate with the heat of a stove or water-bath.*

*Characters of the Resin.*—In brownish translucent pieces, brittle, resinous in fracture, of a sweet fragrant odour, if prepared from the root. It cannot form singly an emulsion with water. Its tincture does not render the fresh-cut surface of a potato blue. Ether dissolves it entirely. *Dose,* 2 to 10 grains.

CONFECTIO SCAMMONII—CONFECTION OF SCAMMONY.—*Take of scammony, in fine powder,* 3 *ounces; ginger, in fine powder,* 1½ *ounce; oil of caraway,* 1 *fluid drachm; oil of cloves,* ½ *fluid drachm; syrup,* 3 *fluid ounces; clarified honey,* ½ *ounce. Rub the powders with the syrup and the honey into a uniform mass, then add the oils, and mix. Dose,* 5 *to* 40 *grains.*

MISTURA SCAMMONII—SCAMMONY MIXTURE.—*Take of resin of scammony,* 4 *grains; milk, two fluid ounces. Triturate the resin of scammony with a little of the milk, and continue the trituration, gradually adding the remainder of the milk until a uniform emulsion is obtained. Dose,* ʒss. *to* ʒii.

PILULA SCAMMONII COMPOSITA—COMPOUND SCAMMONY PILL.—*Take of resin of scammony, resin of jalap, curd soap, in powder, of each,* 1 *ounce; strong tincture of ginger,* 1 *fluid ounce; rectified spirit,* 2 *fluid ounces. Add the spirit and tincture to the soap and* *resins, and dissolve with the aid of a gentle heat; then evaporate the spirit, by the heat of a water-bath, until the mass has acquired a suitable consistence for forming pills. Dose, 5 to 15 grains.*

PULVIS SCAMMONII COMPOSITUS—COMPOUND POWDER OF SCAMMONY.—*Take of scammony, in powder, 4 ounces; jalap, in powder, 3 ounces; ginger, in powder, 1 ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Dose, 5 to 20 grains.*

*Therapeutics.*—Scammony acts as a drastic purgative, causing considerable local irritation in the bowels. It is useful as a derivative purgative in head cases, in dropsies, as a vermifuge, and as a brisk cathartic for children, either alone, or in combination with small doses of rhubarb or calomel. It is especially indicated in cases in which there is torpidity of the abdominal viscera, and is contra-indicated in irritable and inflammatory conditions of the stomach and bowels. In large doses it may give rise to dangerous symptoms, or even prove fatal.

**Jalapa**—Jalap.—Officinal plant: *Exogonium Purga.* Officinal parts:—1. The tubers dried; imported from Mexico. 2. *Jalapæ Resina,* Resin of Jalap; a resin obtained from jalap by means of rectified spirit.

*Characters of the Tubers.*—Varying from the size of a nut to that of an orange, ovoid, the larger tubers frequently incised, covered with a thin, brown, wrinkled cuticle; presenting, when cut, a yellowish-grey colour, with dark-brown concentric circles.

PREPARATION OF THE RESIN.—*Take of jalap, in coarse powder, 8 ounces; rectified spirit, a sufficiency; distilled water, a sufficiency. Digest the jalap with sixteen fluid ounces of the spirit in a covered vessel, at a gentle heat, for twenty-four hours; then transfer to a percolator, and when the tincture ceases to pass, continue the percolation with successive portions of spirit until it ceases to dissolve anything more. Add to the tincture four fluid ounces of the water, and distil off the spirit by a water-bath. Remove the residue, while hot, to an open dish, and allow it to become cold. Pour off the supernatant fluid from the resin, wash this two or three times with hot water, and dry it on a porcelain plate by the heat of a stove or water-bath.*

*Characters of the Resin.*—In dark-brown opaque fragments, translucent at the edges, brittle, breaking with a resinous fracture, readily reduced to a pale-brown powder, sweetish in odour, acrid in the throat, easily soluble in rectified spirit, but only partially so in ether, and insoluble in oil of turpentine. *Dose*, 1 to 5 grains.

EXTRACTUM JALAPÆ—EXTRACT OF JALAP.—*Take of jalap, in coarse powder,* 1 *pound; rectified spirit,* 4 *pints; distilled water,* 1 *gallon. Macerate the jalap in the spirit for seven days; press out the tincture, then filter, and distil off the spirit, leaving a soft extract. Again macerate the residual jalap in the water for four hours, express, strain through flannel, and evaporate by a water-bath to a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding* 140°, *until it has acquired a suitable consistence for forming pills. Dose,* 5 *to* 20 *grains.*

PULVIS JALAPÆ COMPOSITUS—COMPOUND POWDER OF JALAP.—*Take of jalap, in powder,* 5 *ounces; acid tartrate of potash,* 9 *ounces; ginger, in powder,* 1 *ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Dose,* 10 *to* 60 *grs.*

TINCTURA JALAPÆ—TINCTURE OF JALAP.—*Take of jalap, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the jalap for forty-eight hours in* 15 *fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ʒii.

*Therapeutics.*—Jalap acts as a powerful drastic purgative, producing copious liquid evacuations, and occasionally causing nausea and griping. It is usually a safe medicine for children, but in over-doses may give rise to excessive purging and inflammation. It is given to overcome habitual constipation, as a hydragogue in dropsies, as an anthelmintic, as a derivative purgative in head affections, &c. It is useful also as a purgative in febrile and inflammatory affections, as it causes neither vascular excitement nor constitutional disturbance.

**SOLANACEÆ** — The Potato Order. — Herbs or shrubs, widely distributed, but abounding within the tropics. The order furnishes edible tubers and fruit, and medicines which are characterised by tonic, pungent, or stimulant properties. Officinal plants: *Capsicum fastigatum, Solanum Dulcamara.*

**Capsicum**—Capsicum.—Officinal plant: *Capsicum fastigatum.* Officinal part: *Capsici Fructus,* the ripe fruit dried; imported from the coast of Guinea, and from the East and West Indies, and distinguished in commerce as Guinea Pepper and Pod Pepper.

*Characters.*—Pod membraneous, from five to eight lines long, two lines broad, straight, conical, pointed, smooth, shining, but somewhat corrugated, orange-red, intensely hot in taste.

Cayenne Pepper is met with as a reddish powder, which has an intensely acrid burning taste, dependent upon an active solid oil termed Capsicin.

TINCTURA CAPSICI—TINCTURE OF CAPSICUM.—*Take of capsicum fruit, bruised, ¾ ounce; rectified spirit, 1 pint. Macerate the capsicum for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.*

*Dose.*—Of the powder, one to five grains; of the tincture, five to fifteen minims.

*Therapeutics.*—Capsicum acts as an acrid stimulant in moderate doses, and as an irritant poison in over-doses. Externally, it acts as a rubefacient. It is largely used as a condiment, and, as a medicine, is employed chiefly for the sake of its local stimulant action upon the mucous membrane of the mouth, throat, and stomach. It may be given in atonic dyspepsia, and in all cases in which it is desirable promptly to arouse the stomach from a feeble or sluggish condition. The tincture is used as an adjunct to gargles in relaxed or putrid sore throat.

**Dulcamara**—Dulcamara.—Officinal plant: *Solanum Dulcamara*; Bittersweet. Officinal part: The young branches dried; from indigenous plants which have shed their leaves.

*Botany.*—*Root*, woody. *Stem*, shrubby, twining, flexible. *Leaves*, acute, generally smooth, entire at the margins, the lower ones cordate, the upper hastate. *Inflorescence*, racemose; corolla purple, with two green spots at the base of each segment, of which there are five. *Fruit*, a scarlet berry, juicy, and many-seeded. *Habitat*, indigenous; in hedgerows and woods in this and other European countries.

*Characters of the Young Branches.*—Light, hollow, cylindrical, about the thickness of a goose-quill, bitter, and subsequently sweetish to the taste.

The plant contains an alkaloid, *Solania*, which is probably poisonous, acting as an acro-narcotic and dulcamarine, a bitter sweet principle.

INFUSUM DULCAMARÆ—Infusion of Dulcamara.—*Take of dulcamara, bruised,* 1 *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain.*

*Dose.*—Of the infusion, one to three or four fluid ounces.

*Therapeutics.*—Dulcamara is said to act as a diaphoretic, diuretic, demulcent, and alterative, and in over-doses as an acro-narcotic, but its action is obscure and feeble. It has been used in a variety of cases, the decoction forming a convenient vehicle for other medicines, as in chronic pulmonary complaints, in chronic cutaneous diseases, &c.

**ATROPACEÆ**—The Deadly Nightshade Order.—Closely allied to the Solanaceæ. The plants of this order are in general narcotic poisons. Officinal plants: *Atropa Belladonna, Datura Stramonium, Hyoscyamus niger, Nicotiana Tabacum.*

**Belladonna**—Belladonna.—Officinal plant: *Atropa Belladonna,* Deadly Nightshade. Officinal parts:—1. *Belladonnæ Folia,* Belladonna Leaves, fresh and dried, and the fresh branches, gathered, when the fruit has begun to form, from wild or cultivated plants in Britain. 2. *Belladonnæ Radix,* Belladonna Root: The root dried; imported from Germany. 3. *Atropia,* an alkaloid ($C_{17}H_{23}NO_3$) obtained from belladonna root.

*Botany.*—*Root,* perennial, thick, fleshy, branched, often a foot or more in length. *Stems,* herbaceous, annual, three to five feet high, branched, downy, of a reddish tinge. *Leaves,* alternate, four or five inches long, often in pairs of unequal size, broadly ovate, acute. *Flowers,* solitary, stalked, drooping, about one inch in length; corolla campanulate, greenish towards the base, but dark-purple towards the extremity. *Berry,* of a shining violet-black colour, two-celled, about the size of a small cherry, and contains numerous reniform seeds embedded in a mawkish pulp. *Habitat,* indigenous; growing in waste and shady places. It flowers in June and July, and the berries ripen in September.

*Characters.*—Leaves alternate, three to six inches long, ovate, acute, entire, smooth, the uppermost in pairs, and unequal, fœtid when bruised. The expressed juice or an infusion dropped into the eye dilates the pupil. The root is from one to two feet long, and from half-an-inch to two inches thick, branched and wrinkled, brownish-white. An infusion dropped into the eye dilates the pupil. The leaves of the wild plant are more esteemed than the leaves of the cultivated plant, and they are said to possess their active principle most abundantly when the fruit has just begun to form; all parts of the plant contain the alkaloid atropia, which is the active principle combined with malic acid.

EMPLASTRUM BELLADONNÆ—BELLADONNA PLASTER.—*Take of extract of belladonna, resin plaster, of each,* 3 *ounces; rectified spirit,* 6 *fluid ounces. Rub the extract and spirit together in a mortar, and when the insoluble matter has subsided, decant the clear solution, remove the spirit by distillation or evaporation, and mix the alcoholic extract thus obtained with the resin plaster melted by the heat of a water-bath, continuing the heat until with constant stirring the plaster has acquired a suitable consistence.*

EXTRACTUM BELLADONNÆ—EXTRACT OF BELLADONNA.—*Take of the fresh leaves and young branches of belladonna,* 112 *pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to* 130°, *and separate the green colouring matter by a calico filter. Heat the strained liquor to* 200° *to coagulate the albumen, and again filter. Evaporate the filtrate by a water-bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and, stirring the whole together assiduously, continue the evaporation at a temperature not exceeding* 140°, *until the extract is of a suitable consistence for forming pills. Dose,* ¼ *to* 2 *grains.*

LINIMENTUM BELLADONNÆ—LINIMENT OF BELLADONNA.—*Take of belladonna root, in coarse powder,* 20 *ounces; camphor,* 1 *ounce; rectified spirit, a sufficiency. Moisten the belladonna with some of the spirit, and macerate in a closed vessel for three days; then transfer to a percolator, and, adding more spirit, percolate slowly into a receiver containing the camphor, until the product measures one pint.*

SUCCUS BELLADONNÆ—JUICE OF BELLADONNA.—*Take of fresh leaves and young branches of belladonna,* 7 *pounds; rectified spirit, a sufficiency. Bruise the belladonna in a stone mortar, press out the juice, and to every three measures of juice add one of rectified spirit. Set aside for seven days, and filter. Keep it in a cool place. Dose,* 5 *to* 15 *mins.*

TINCTURA BELLADONNÆ—TINCTURE OF BELLADONNA.—*Take of belladonna leaves, in coarse powder,* 1 *ounce; proof spirit,* 1 *pint. Macerate the leaves for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation* *with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose, 5 to 30 mins.*

UNGUENTUM BELLADONNÆ—OINTMENT OF BELLADONNA.—*Take of extract of belladonna, 80 grains; prepared lard, 1 ounce. Rub the extract smooth with a few drops of distilled water, then add the lard, and mix thoroughly.*

**Atropia**—Atropia.—An alkaloid ($C_{17}H_{23}NO_3$) obtained from belladonna root.

PREPARATION.—*Take of belladonna root, recently dried, and in coarse powder, 2 pounds; rectified spirit, 10 pints; slaked lime, 1 ounce; diluted sulphuric acid, carbonate of potash, of each, a sufficiency; chloroform, 3 fluid ounces; purified animal charcoal, a sufficiency; distilled water, 10 fluid ounces. Macerate the root in four pints of the spirit for twenty-four hours, with frequent stirring. Transfer to a displacement apparatus, and exhaust the root with the remainder of the spirit by slow percolation. Add the lime to the tincture placed in a bottle, and shake them occasionally several times. Filter, add the diluted sulphuric acid in very feeble excess to the filtrate, and filter again. Distil off three-fourths of the spirit, add to the residue the distilled water, evaporate at a gentle heat, but as rapidly as possible, until the liquor is reduced to one-third of its volume, and no longer smells of alcohol; then let it cool. Add very cautiously, with constant stirring, a solution of the carbonate of potash, so as nearly to neutralize the acid, care, however, being taken that an excess is not used. Set to rest for six hours, then filter, and add carbonate of potash in such quantity that the liquid shall acquire a decided alkaline reaction. Place it in a bottle with the chloroform; mix well by frequently repeated brisk agitation, and pour the mixed liquids into a funnel furnished with a glass stopcock. When the chloroform has subsided, draw it off by the stopcock, and distil it on a water-bath from a retort connected with a condenser. Dissolve the residue in warm rectified spirit; digest the solution with a little animal charcoal; filter, evaporate, and cool until colourless crystals are obtained.*

*Characters of Atropia.*—In colourless acicular crystals, sparingly soluble in water, more readily in alcohol and in ether. Its solution in water has an alkaline reaction, gives a citron-yellow precipitate with terchloride of gold, has a bitter taste, and powerfully dilates the pupil. It is an active poison.

LIQUOR ATROPIÆ—SOLUTION OF ATROPIA.—*Take of atropia, 4 grains; rectified spirit, 1 fluid drachm; distilled water, 7 fluid* *drachms. Dissolve the atropia in the spirit, and add this gradually to the water, shaking them together.*

ATROPIÆ SULPHAS — SULPHATE OF ATROPIA. — *Take of atropia,* 120 *grains; distilled water,* 4 *fluid drachms; diluted sulphuric acid, a sufficiency. Mix the atropia with the water, and add the acid gradually, stirring them together until the alkaloid is dissolved and the solution is neutral. Evaporate it to dryness at a temperature not exceeding* 100°.

*Characters and Tests.*—A colourless powder, soluble in water, forming a solution which is neutral to test paper, and when applied to the eye dilates the pupil, as the solution of atropia does. It leaves no ash when burned with free access of air.

Intended for external application. It is a powerful poison.

LIQUOR ATROPIÆ SULPHATIS—SOLUTION OF SULPHATE OF ATROPIA.—*Take of sulphate of atropia,* 4 *grains; distilled water,* 1 *fluid ounce. Dissolve.*

UNGUENTUM ATROPIÆ—OINTMENT OF ATROPIA.—*Take of atropia,* 8 *grains; rectified spirit,* ½ *fluid drachm; prepared lard,* 1 *ounce. Dissolve the atropia in the spirit, add the lard, and mix thoroughly.*

*Therapeutics.*—Belladonna belongs to the class of deliriant narcotics, or cerebro-spinants, in common with henbane, stramonium, &c. In over-doses it is poisonous, producing, more or less, the following symptoms :—Hoarseness of voice, and dryness of the mouth and throat, complete or partial aphonia, ineffectual attempts at vomiting, excessive dilatation of the pupils, vision variously affected, but always more or less impaired, eyes suffused, face benumbed, singing in the ears, or other noises in the head; deglutition is difficult, or impossible; pulse is very much accelerated (often 50 to 60 beats per minute); palpitation of the heart, weakness of the limbs, tendency to syncope, giddiness, great general excitement, and a disposition to fight, laugh, or talk; inability to control the movements of the muscles by any effort of the will, catching at imaginary objects in the air, incoherent replies to questions, &c. The saliva is diminished and the secretion of the skin, while that of the kidneys is increased. This stage is followed by a condition of coma, which may end in death. The pulse, in fatal cases, gets more and more rapid, intermittent, and weak. Recovery is ushered in by a repetition of the symptoms of mirthful delirium. There is sometimes an eruption upon the skin resembling that of scarlatina; strangury is occasionally observed. The characteristic symptoms are dryness of the throat, dilatation of the pupil, perversion of vision, and mirthful delirium. Recovery is gradual, and the patient has no recollection of his previous condition; the pupil is slowly restored, and there remains marked nervous depression for a considerable time. Poisoning not unfrequently occurs from eating the berries, plucked from the plant, in ignorance of their action. In September, 1865, a man, with well-marked symptoms of belladonna poisoning, was brought under my care in the Infirmary, after having eaten only seven of the berries.

*Medicinally*, belladonna is employed as an anodyne, hypnotic, antispasmodic, mydriatic, diuretic, and stimulant.

As an *anodyne* it acts by paralysing the ends of the motor and sensory nerves, and is useful in local nervous pains, such as tic-douloureux, prosopalgia, cardiac neuralgia, pain from inflammatory swelling, to relieve the pain resulting from the pressure of internal aneurism, in intercostal neuralgia, in lumbago, myalgia, orchitis, and chordee, dysmenorrhœa, irritable uterus, uterine cancer, &c.; in incontinence of urine due to hyperæsthesia of the bladder. For its full anodyne effects, the local application of the medicine should be combined with its internal administration. For its local effects upon the intrapelvic organs atropia is frequently administered in suppositories or pessaries, with or without other medicament, such as hydrochlorate of morphia, nitrate of silver, &c. Each pessary should contain about one-twentieth of a grain of atropia.

As an *hypnotic*, it may be employed as a substitute for opium, but it is not nearly so certain in its action. Dr. John Harley asserts that, given in combination with opium or morphia, it greatly enhances the hypnotic effects of the opiate, while it diminishes the disagreeable after effects.

As an *antispasmodic* in hooping-cough, laryngismus stridulus, and in spasmodic coughs generally, in epilepsy and chorea, in spasmodic stricture of the urethra, in rigidity of the cervix uteri, in spasm of the sphincter ani, in certain cases of incontinence of urine, in chordee, to correct the griping of various medicines, in habitual constipation, &c.

As a *mydriatic*, it is employed in ophthalmic surgery to dilate the pupil. How it dilates the pupil is still doubtful. This dilatation may be brought about in three ways—by paralysis of the oculo-motor nerve-fibres distributed to the circular fibres of the iris; by stimulation of the sympathetic branches supplying the radiating fibres; or by a double action. There is proof that the ends of the oculo-motor are paralysed, perhaps also the sympathetic are stimulated. But in whatever way we may explain its action, belladonna is practically of the greatest value to the ophthalmic surgeon to facilitate ophthalmoscopic examination, to prevent or restore prolapse of the iris in wounds of the cornea, to prevent or break up adhesions, to allay pain and inflammation in ulcer of the cornea and conjunctivitis, to facilitate operation for cataract, &c. Besides dilating the pupil, the extract of belladonna, when smeared over the eyebrow, at the same time greatly diminishes the browache so frequently attendant upon inflamed conditions of the eye.

As a *diuretic*, it is possessed of considerable reputation, and is strongly recommended by Dr. John Harley, who gives a large number of cases in evidence of this action of belladonna. He shows that the elimination of atropia by the kidneys commences the minute it is injected through the skin, and that in two and a-half hours afterwards none is left; that, besides the fluid constituents of the urine, it increases the amount of urea excreted, notably so of the phosphates and sulphates, and somewhat diminishes the chlorides. He found it beneficial in acute nephritis, in chronic albuminuria (provided the degeneration of the kidney is not the fatty variety), and recommends it as likely to be beneficial in suppression of urine and in uræmia. In acting as a diuretic, Dr. Harley believes it does so as a stimulant to the sympathetic nerve centres of the kidneys, due to its stimulant action on the sympathetic nerves.

As a *vasculo-cardiac stimulant*. The admirable researches of Dr. John Harley have proved that this is the primary and most essential effect of belladonna, acting through the sympathetic system, it stimulates the circulation generally, and that it is only by increasing the activity of the vascular walls and of the circulation throughout the various nerve-centres that it appears to diminish their vascularity, though at the same time it increases the amount of blood circulating through the part in a given time. As a vasculo-cardiac stimulant, Dr. Harley recommends it in all diseased conditions in which there is depression of the sympathetic nerve-force, as in syncope from asthenia and from shock, in the collapse of cholera, in failure of the heart's action from chloroform, aconite, colchium, and other cardiac paralysers (atropia being introduced subcutaneously); in poisoning from opium as it stimulates the respiratory centres as well as the circulatory system, and is so far antagonistic to the action of opium; in pneumonia, in depressed conditions occurring during the course of continued fever, &c. Care must always be taken not to administer too large a dose, lest the stage of stimulation pass into that of depression.

Belladonna possesses remarkably the power of preventing the secretion of milk, and an excellent lactifuge application is to cover the mamma with a belladonna plaster. It is also generally believed to be useful in those cases of excessive salivary secretion which occasionally occur during pregnancy, or due to mercurialism. In hyperæmia of the cord or its membranes, it is of the greatest value, and to check excessive sweating, as in phthisis, &c. It has been supposed prophylactic against scarlet fever, but there is the best reason to believe that this is an opinion unfounded on fact. Atropia and its sulphate, or their solutions, are rarely given internally; the dose would be $\frac{1}{60}$th gr. cautiously increased; hypodermically, $\frac{1}{100}$th gr. and upwards; of either solutions 2 mins. equal $\frac{1}{60}$th. These solutions are also used to dilate the pupil by placing a drop upon the eye, but the liq. atropiæ sulphatis is more frequently used as it is less irritating locally, not requiring the addition of rectified spirit to dissolve it as the liq. atropiæ does. But atropine paper, or atropine gelatine discs are now commonly employed for dilating the pupil; as solutions of atropia are so liable to change, they should only be made when required and not kept ready. *Chemical incompatibles* are the caustic fixed alkalies (Garrod) or liquor potassæ or sodæ, because they decompose the atropia and render it inert. *Treatment of an overdose.*—Stimulants, emetics, caustic alkalies, cold to the head, stimulants externally and internally, and hyperdermic injection of ex. physostigmatis, $\frac{1}{4}$ gr.

**Stramonium**—Stramonium.—Officinal plant: *Datura Stramonium;* Thorn-apple. Officinal parts:—1. *Stramonii Folia,* Stramonium Leaves, the leaves dried; collected from plants cultivated in Britain, when they are in flower. 2. *Stramonii Semina,* Stramonium Seeds, the ripe seeds.

*Botany.*—An indigenous herbaceous annual, growing in waste places and on dunghills. *Root,* large, white, fibrous. *Stems,* much branched, smooth, fetid. *Leaves,* large, unequal at the base, ovate, unequally sinuate-dentate. *Flowers,* axillary, erect, white, giving off an agreeable odour, especially at night. Flowers in July.

*Characters of the Leaves.*—Large, ovate, sinuous, deeply cut; of a heavy odour, which is strongest while they are drying, and of a mawkish, faintly bitter, nauseous taste. *The Seeds* are brownish-black, reniform, flat, rough in taste, feebly bitter, and mawkish; inodorous, unless bruised, when they emit a peculiar heavy smell.

The plant owes its medicinal properties to an alkaloid, *Daturia,* which may be obtained in colourless prismatic crystals; it is identical with atropia both in chemical composition and physiological action.

EXTRACTUM STRAMONII — EXTRACT OF STRAMONIUM.—*Take of stramonium seeds, in coarse powder, 1 pound; ether, 1 pint, or a sufficiency; distilled water, proof spirit, of each, a sufficiency. Shake the ether in a bottle with half-a-pint of the water, and after separation decant the ether. Pack the stramonium in a percolator, and free it from its oil by passing the washed ether slowly through it. Having removed and rejected the ethereal solution, pour the spirit over the residue of the stramonium in the percolator, and allow it to pass through slowly until the powder is exhausted. Distil off most of the spirit from the tincture, and evaporate the residue by a water-bath until the extract has acquired a suitable consistence for forming pills. Dose, ¼ to 2 grains.*

TINCTURA STRAMONII—TINCTURE OF STRAMONIUM.—*Take of stramonium seeds, bruised, 2½ ounces; proof spirit, 1 pint. Macerate the stramonium for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining 5 ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make 1 pint. Dose, 10 to 30 minims.*

*Therapeutics.*—Stramonium acts as a narcotic, anodyne, and antispasmodic, and in over-doses produces poisonous symptoms resembling those which follow an over-dose of belladonna, and their treatment is the same as in poisoning by belladonna. It has been employed to relieve pain in neuralgic, rheumatic, and other painful affections, to relieve spasm, especially in spasmodic asthma, for the relief of which it may be cautiously smoked; in epilepsy, chorea, &c., being used internally for the same purposes as belladonna; its action differing from belladonna only in degree and not in kind, as its preparations are less powerful and more variable, containing less of the alkaloid.

**Hyoscyami Folia**—Hyoscyamus Leaves.—Officinal plant: *Hyoscyamus niger;* Henbane. The fresh leaves, with the branches, of the indigenous biennial plant, dried; collected when about two-thirds of the flowers are expanded.

*Botany.*—The plant is usually biennial, but under favourable circumstances it is annual. *Root,* spindle-shaped. *Stem* is usually simple, or but little branched, hirsute, one to three feet high. *Leaves,* large, dull-green, unequally sinuate, downy, clammy, and have a fetid odour; the radicle leaves only appear in the first year, and the other leaves with the stems appear in the following spring.

*Flowers*, numerous, unilateral, drooping, nearly sessile ; corolla and calyx funnel-shaped ; corolla dull straw colour, reticulated with dark-purple veins. *Fruit*, capsular, with small, roundish, yellowish-grey, and finely-dotted seeds. The biennials flower in June, the annuals a little later ; seeds ripen from August to October. *Habitat*, indigenous, waste places, and commons.

*Characters.*—Leaves sinuated, clammy, and hairy. The fresh herb has a strong unpleasant odour, and a slightly acrid taste, which nearly disappears on drying. The fresh juice dropped into the eye dilates the pupil.

The plant contains an alkaloid, *Hyoscyamia,* which closely resembles atropia.

EXTRACTUM HYOSCYAMI — Extract of Hyoscyamus.—*Take of the fresh leaves and young branches of hyoscyamus,* 112 *pounds. Bruise in a stone mortar, and press out the juice; heat it gradually to* 130°, *and separate the green colouring matter by a calico filter. Heat the strained liquor to* 200° *to coagulate the albumen, and again filter. Evaporate the filtrate by a water-bath to the consistence of a thin syrup; then add to it the green colouring matter previously separated, and, stirring the whole assiduously, continue the evaporation at a temperature not exceeding* 140°, *until the extract is of a suitable consistence for forming pills. Dose,* 2 *to* 5 *grs.*

SUCCUS HYOSCYAMI—Juice of Hyoscyamus.—*Take of fresh leaves and young branches of hyoscyamus,* 7 *pounds; rectified spirit, a sufficiency. Bruise the hyoscyamus in a stone mortar, press out the juice, and to every three measures of juice add one of spirit. Set aside for seven days, and filter. Keep it in a cool place. Dose,* ʒss. *to* ʒi.

TINCTURA HYOSCYAMI—Tincture of Hyoscyamus.—*Take of hyoscyamus leaves, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the hyoscyamus for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the products, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 20 *mins. to* ʒss.

*Therapeutics.*—Henbane is very similar to belladonna in its actions, only the primary stimulant effects on the pulse are not so well marked ; but it causes the same symptoms of delirium which belladonna produces. It differs from opium in not causing constipation, and not checking secretion, and in causing dilatation, and never contraction, of the pulse. From belladonna and stramonium it also differs in being less active. Poisonous doses are followed by dilatation of the pupil and disturbance of vision, mirthful or furious delirium, coma; sometimes nausea, vomiting, and purging; the face is often distorted, and there is ultimately more or less of paralysis, with occasional convulsive movements. In small and repeated does it acts as a calmative, tranquillizing the patient, and allaying general and local nervous irritability and excitement, producing sleep rather by its soothing influence than by any direct action upon the nervous system. It is employed as a calmative and sedative in a variety of cases, and also to relieve pain and procure sleep. It may be given as a substitute for opium in cases in which the latter is an objectionable remedy. It is occasionally also used as an antispasmodic, but is inferior to belladonna and stramonium. Topically, by fomentation or cataplasm, or by the application of the extract, it may be used as an anodyne to painful swellings, hæmorrhoids, neuralgic and rheumatic pains, &c., but is often unavailing. It is frequently combined with purgatives to correct their irritating and griping qualities. It may be given in moderate doses to children to allay the irritation produced by teething, when there is a tendency to convulsions, &c.

**Tabaci Folia**—Leaf Tobacco.—Officinal plant: *Nicotiana Tabacum;* Virginian Tobacco. The dried leaves; cultivated in America.

*Characters.*—Large, mottled-brown, ovate or lanceolate acuminate leaves, bearing numerous short glandular hairs; having a peculiar heavy odour, and nauseous, bitter, acrid taste; yielding, when distilled with solution of potash, a liquid alkaloid, which has the peculiar odour of nicotia, and precipitates with perchloride of platinum and tincture of galls.

Tobacco contains, in addition to other constituents, a liquid alkaloid, *Nicotia* or *Nicotina,* and a concrete volatile oil, *Nicotianin.* *Nicotia* or *Nicotina* ($C_{10}H_{14}N_2$) is a colourless oily liquid, but when exposed to the atmosphere it turns first yellow, then brown, and finally becomes solid by the absorption of oxygen. It is inflammable, has an irritating odour, and an acrid, burning taste. It is soluble in alcohol, ether, water, and the fixed and volatile oils.

ENEMA TABACI—ENEMA OF TOBACCO.—*Take of leaf tobacco,* 20 *grains; boiling water,* 8 *fluid ounces. Infuse in a covered vessel for half-an-hour, and strain.*

*Therapeutics.*—Tobacco acts as an acro-narcotic poison, causing nausea, vomiting, and often purging, utter prostration of muscular power; heart's action greatly reduced, pulse small, weak, fluttering, and almost imperceptible; face pale, extremities cold, great anxiety, muscular tremors; pupils contracted, vision impaired, respiration more or less labouring, and the entire body bathed in a cold clammy sweat; paralysis, with occasional convulsive movements and stupor, lead to death. In smaller doses tobacco acts as a sedative and antispasmodic, and somewhat as a diuretic, and as an emetic and laxative. These effects are due to its local irritant action, to its depressing the functions of the spinal cord and paralysing the motor nerves, death being due to asphyxia from interference with the respiratory function. As an emetic, its action is both direct and indirect, and its purgative power is due to its exciting tetanic contractions of the intestines. Tobacco is not often used medicinally, in consequence of its violent action. It has been given with various results in strangulated hernia, ileus, tetanus, spasmodic asthma, and strychnia poisoning, rigidity of the os uteri, spasm of the sphincter ani, and other conditions, as an antispasmodic; as a diuretic in dropsies; as a topical application in a variety of skin diseases; as an anthelmintic, &c. *Treatment of an over-dose.*—An emetic, stimulants, ammonia or alcohol, hypodermic use of strychnia, and artificial respiration. The habit of tobacco-smoking in some individuals, especially when largely indulged in, leads to functional irregularity of the heart, weakening of the cardiac action, disturbances of vision, and various other disagreeable nervous symptoms and gastric derangements.

**SCROPHULARIACEÆ**—Herbs or under-shrubs, universally distributed. Some of the species possess acrid, others sedative properties. Officinal plant: *Digitalis purpurea.*

**Digitalis Folia**—Digitalis leaves.—Officinal plant: *Digitalis purpurea;* Purple Foxglove. The dried leaves; from wild indigenous plants, gathered when about two-thirds of the flowers are expanded.

*Botany.*—Herbaceous, biennial. *Stem*, erect, three or four feet high, simple, roundish, slightly angular, and downy. *Leaves*, alternate, downy, dull green, ovate-lanceolate or oblong, and ramified with veins. *Inflorescence*, racemose, terminal, erect, one-sided. *Flowers*, numerous, pendulous, inodorous; corolla campanulate, crimson, internally hairy and marked with eye-like spots. *Seeds*, small, roundish, somewhat angular, greyish-brown. *Habitat*, indigenous, growing in pastures, hedgerows, and upon banks.

*Characters of the Leaves.*—Ovate lanceolate, shortly petiolate, rugose, downy, paler on the under surface, crenate.

The leaves, of the second year, are to be gathered in the month of July, when two-thirds of the flowers are expanded, and before the ripening of the seeds. After the removal of the stalks and mid-ribs, the leaves are dried in baskets in a dark place by means of a stove heat. The dried leaves and powder are prone to change, losing their medicinal properties by keeping; they should, therefore, be kept from the influence of air and light, and should be renewed annually. When carefully dried and preserved they are of a bright green colour, have but little odour, but a nauseous, bitter, acrid taste. Besides other constituents, they contain

**Digitalinum**—Digitalin.—The active principle obtained from Digitalis.

PREPARATION.—*Take of digitalis leaf, in coarse powder,* 40 *ounces; rectified spirit, distilled water, acetic acid, purified animal charcoal, solution of ammonia, tannic acid, oxide of lead, in fine powder, pure ether, of each, a sufficiency. Digest the digitalis with a gallon of the spirit for twenty-four hours at a temperature of* 120°, *then put them into a percolator, and when the tincture has ceased to drop, pour a gallon of spirit on the contents of the percolator, and allow it slowly to percolate through. Distil off the greater part of the spirit from the tincture, and evaporate the remainder over a water-bath until the whole of the alcohol has been dissipated. Mix the residual extract with five ounces of distilled water, to which half-an-ounce of acetic acid has been previously added, and digest the solution thus formed with a quarter of an ounce of purified animal charcoal; then filter and dilute the filtrate with distilled water until it measures a pint. Add solution of ammonia nearly to neutralisation, and afterwards add one hundred and sixty grains of tannic acid dissolved in three ounces of distilled water. Wash the precipitate that will be formed with a little distilled water; mix it with a small quantity of the spirit and a quarter of an ounce of the oxide of lead, and rub them together in a mortar. Place the mixture in a flask, and add to it four ounces of the spirit; raise the temperature to* 160°, *and keep it at this heat for about an hour; then add a quarter of an ounce of purified animal charcoal; put it on a filter, and from the filtrate carefully drive off the spirit by the heat of a water-bath. Lastly, wash the residue repeatedly with pure ether. Dose,* $\frac{1}{60}$*th to* $\frac{1}{30}$*th grs.*

*Characters.*—In porous mammillated masses or small scales, white, inodorous, and intensely bitter; readily soluble in spirit, but almost insoluble in water and in pure ether; dissolves in acids, but does not form with them neutral compounds; its solution in hydrochloric acid is of a faint yellow colour, but rapidly becomes green. It powerfully irritates the nostrils, and is an active poison.

INFUSUM DIGITALIS — Infusion of Digitalis. — *Take of digitalis, dried,* 30 *grains; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. This infusion has half the strength of infusum digitalis,* Ed. Dub. *Dose,* ʒi. *to* ℥i.

TINCTURA DIGITALIS—Tincture of Digitalis.—*Take of digitalis leaves, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the digitalis for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 5 *to* 30 *mins.*

*Dose.*—Of digitalis, in powder, half-a-grain to two grains.

*Therapeutics.*—Digitalis is a tonic and stimulant to the heart and circulation when given in moderate doses. Thus the heart contracts more slowly and powerfully, and there is contraction of the capillaries, and as a result the blood pressure is raised. If the dose be increased, the action of the heart becomes embarrassed from the ventricular contractions being too forcible and prolonged, and the blood pressure falls, hence the symptoms of this over stimulation correspond exactly with those due to a paralytic condition of the organ, although the cause is exactly the opposite, as is shown by the fact that after death from digitalis poisoning, the heart is found in a state of firm contraction. This explains how the slow, regular pulse, after a moderate dose of the remedy, becomes feeble and intermittent, and irregular after a large dose. The symptoms of an overdose being those of failure of cardiac action—viz., giddiness, pallor of the surface, syncope, dilated pupils, pulse small and irregular. These symptoms are usually accompanied with abdominal pain, vomiting and purging due to its local irritant action. Fatal cases terminate by collapse, occasionally attended with unconsciousness, suppression of urine, and convulsions.

As to the *modus operandi* of the drug on the heart and circulation, it appears to act as a direct stimulant to the cardiac muscle itself, and to the cardiac inhibitory fibres of the vagus. It may also slightly stimulate the sympathetic, but this action is comparatively feeble, and is soon overcome by the more powerful action on the vagus. It causes contraction of the capillaries, probably by an action on the vaso-motor centres in the cord. As a result, the cardiac beats are slower and more powerful, and the blood pressure is increased.

In virtue of this action on the circulation, digitalis is a diuretic in dropsy, especially from heart disease, that is to say, its action is indirect from increase of arterial tension, and not from any stimulating action on the kidneys. Its action is, however, slow, but is persistent when it does occur. This slow action of digitalis as a diuretic, and the fact long ago pointed out by Withering—viz., that it succeeds best when the pulse is feeble and intermitting, face pale, and lips livid, is another proof of the stimulant action of the drug on the heart and circulation; and the amount of urine passed is the best guide for the safe administration of the drug, because whenever its stimulant action is excessive, and the heart and circulation begin to be embarrassed, the amount of urine passed diminishes (Dr. Geo. Balfour)—"hence so long as that continues greater, or as great as when the digitalis was first commenced, so long we may safely continue the drug; but whenever the quantity begins to fail, we ought to drop the digitalis for a day or two."

Therapeutically, digitalis is a cardiac stimulant and tonic and diuretic, and is principally employed in heart disease and dropsy from loss of cardiac power. In a weak heart, from whatever cause, when the heart is unequal to the work, and disturbance of its action and embarrassment of the circulation follow, digitalis is invaluable, relieving the symptoms, and, in some cases, curing the disease—hence its power of relieving palpitation, irregular action, dyspnœa, and dropsy, &c.

This tonic action of the drug is very evident in the benefit which follows its administration in dilatation. It is also very useful in aortic and mitral disease; in the former it requires to be given in full doses, as the danger in these cases is from death from systole. In these cases it is said by some to be contra-indicated, but this is only from a misapprehension of its real action, but it should not be given in simple hypertrophy. But from our knowledge of the physiological action of digitalis, it is evident that a knowledge of the relation of the heart to the work required is much more necessary to the physician than the nature of the cardiac lesion as a guide to the employment of digitalis.

But Dr. Brunton has stated that it should be withheld in cases of fatty heart and capillary atheroma in case of rupture; this objection is, however, simply theoretical, and is not borne out by clinical experience. Besides, the diagnosis of fatty heart is extremely difficult, and there can be no doubt that there would be more risk to the patient in the withholding than in the administration of digitalis when otherwise indicated in these cases; hence, of two evils choose the least—*i.e.*, give digitalis.

Digitalis may also be given in pneumonia with advantage, and other inflammatory affections. As a cardiac stimulant in syncope from hæmorrhage, poisoning with aconite, to which it is a physiological antidote administered hypodermically.

As a diuretic, it is especially useful in dropsy due to cardiac disease, and may be well combined with squill, or with squill and blue pill. It is also useful, though not so efficacious, in cases of dropsy into serous cavities, as into the peritoneum. In the latter condition a strong infusion, applied externally, is found greatly to aid the internal administration.

Digitalis may be given in powder, infusion, or tincture, of these the tincture is the most satisfactory form, as it is the most reliable, the dose being 10-30 mins., according to circumstances. The following prescription the Editor has found most useful:—Tinct. Digitalis, ʒiii.; Spt. Chloroformi, ℥i.; Tinct. Card. co. ℥i.; Aquam, ad. ℥vi.; *Dose*, ℥ss. thrice daily. Of Digitaline (B.P.), the dose is $\frac{1}{60}$th gr.; of the crystallized variety (NATIVELLE'S), the dose is one granule containing $\frac{1}{260}$th of a grain, or four times stronger than that of Homalle and Quevenne, which is officinal. *Treatment of over-dose*, rest in the recumbent position and stimulants.

**LABIATEÆ or LAMIACEÆ**—The Labiate or Dead-Nettle Order.—Herbs or undershrubs, inhabiting temperate climates. The medicinal properties of the plants are due to the presence of a volatile oil, to which also they owe their fragrance; they are chiefly employed as carminatives and antispasmodics. Officinal plants: *Lavandula vera, Mentha piperita, Mentha viridis, Rosmarinus officinalis.*

**Oleum Lavandulæ**—Oil of Lavender.—Officinal plant: *Lavandula vera;* Lavender. Officinal part: The oil, distilled in Britain from the flowers.

*Botany.*—An undershrub, one to three feet in height, with oblong-linear, or lanceolate, entire leaves. *Inflorescence*, interrupted spikes; flowers, purplish-grey, in whorls of six to ten flowers. *Habitat*, south of Europe; largely cultivated.

*Characters of the Oil.*—Colourless or pale yellow, with the odour of lavender, and a hot bitter aromatic taste. *Dose*, 2-5 mins.

SPIRITUS LAVANDULÆ—SPIRIT OF LAVENDER.—*Take of oil* *of lavender,* 1 *fluid ounce; rectified spirit,* 49 *fluid ounces. Dissolve. Dose,* ʒss. *to* ʒi.

TINCTURA LAVANDULÆ COMPOSITA—Compound Tincture of Lavender.—*Take of oil of lavender,* 1½ *fluid drachm; oil of rosemary,* 10 *minims; cinnamon bark, bruised, nutmeg, bruised, of each,* 150 *grains; red sandal-wood,* 300 *grains; rectified spirit,* 2 *pints. Macerate the cinnamon, nutmeg, and red sandal-wood in the spirit for seven days in a closed vessel, with occasional agitation; then press, strain, and dissolve the oils in the strained tincture, and add sufficient rectified spirit to make two pints. Dose,* ʒss. *to* ʒii.

*Therapeutics.* — Lavender acts as an aromatic stimulant and stomachic; its preparations are usually employed as adjuncts to other medicines, but may be given separately either in water or dropped upon sugar.

**Oleum Menthæ Piperitæ**—Oil of Peppermint.—Officinal plant: *Mentha Piperita;* Peppermint. Officinal part: The oil, distilled in Britain from the fresh herb when in flower.

*Botany.*—Perennial herb. *Root,* creeping. *Stem,* erect, smooth, quadrangular. *Leaves,* ovate-oblong, acute, serrated, smooth. *Inflorescence,* lax spikes; flowers violet-coloured. *Habitat,* indigenous; extensively cultivated.

*Characters of the Oil.*—Colourless or pale yellow, with the odour of peppermint; taste, warm aromatic, succeeded by a sensation of coldness in the mouth. *Dose,* 2-5 mins.

AQUA MENTHÆ PIPERITÆ—Peppermint Water.—*Take of oil of peppermint,* 1½ *fluid drachm; water,* 1½ *gallon. Distil one gallon. Dose,* ℥ss. *to* ℥ii.

ESSENTIA MENTHÆ PIPERITÆ—Essence of Peppermint. —*Take of oil of peppermint,* 1 *fluid ounce; rectified spirit,* 4 *fluid ounces. Mix. Dose,* 10 *to* 20 *mins.*

SPIRITUS MENTHÆ PIPERITÆ—Spirit of Peppermint.—*Take of oil of peppermint,* 1 *fluid ounce; rectified spirit,* 49 *fluid ounces. Dissolve. Dose,* ʒss. *to* ʒi.

*Therapeutics.*—Peppermint acts as an aromatic stimulant, carminative, stomachic, and antispasmodic, and as such its preparations are given either alone or with other medicines, to disguise their taste and odour, or to correct their irritating and griping qualities. They are also much used to overcome flatulence.

**Oleum Menthæ Viridis**—Oil of Spearmint.—Officinal plant: *Mentha viridis;* Spearmint. Officinal part: The oil, distilled in Britain from the fresh herb when in flower.

*Botany.*—Perennial herb. *Root,* creeping. *Stem,* erect, smooth. *Leaves,* ovate-lanceolate, sessile, smooth. *Inflorescence,* loose spikes. *Habitat,* indigenous.

*Characters of the Oil.*—Colourless or pale yellow, with the odour and taste of spearmint. *Dose,* 2 to 5 mins.

AQUA MENTHÆ VIRIDIS—Spearmint Water.—*Take of oil of spearmint,* 1½ *fluid drachm; water,* 1½ *gallon. Distil one gallon. Dose,* ℥ss. *to* ℥ii.

*Therapeutics.*—Spearmint acts as an aromatic stimulant, carminative, and stomachic, and as such the water is employed as a vehicle for other medicines.

**Oleum Rosmarini**—Oil of Rosemary.—Officinal plant: *Rosmarinus officinalis;* Rosemary. Officinal part: The oil, distilled from the flowering tops.

*Botany.*—A leafy shrub, five to seven feet high. *Leaves,* opposite, sessile, linear, hoary beneath. *Inflorescence,* short axillary racemes; flowers, greyish-blue or lavender-coloured. *Habitat,* south of Europe; cultivated in England.

*Characters of the oil.*—Colourless, with the odour of rosemary, and a warm aromatic taste. *Dose,* 2 to 5 mins.

SPIRITUS ROSMARINI—Spirit of Rosemary.—*Take of oil of rosemary,* 1 *fluid ounce; rectified spirit,* 49 *fluid ounces. Dissolve. Dose,* ʒss. *to* ʒi.

*Therapeutics.*—Rosemary acts as an aromatic stimulant, carminative, and stomachic. The oil is sometimes added to liniments for the sake of its fragrance. The spirit is often added to hair washes.

### Sub-Class IV.—Apetalæ.

**POLYGONACEÆ**—The Buckwheat Order.—Herbs, rarely shrubs, generally distributed both in cold and warm climates. The plants possess acid, astringent, and purgative properties.

**Rhei Radix**—Rhubarb Root.—Officinal plant: *Rheum Officinale.* Officinal part: The root, deprived of the bark and dried; from Chinese Thibet and Tartary.

*Characters of Rhubarb.*—Trapezoidal, roundish, cylindrical or flattish pieces, frequently bored with one hole, yellow externally, internally marbled with fine waving greyish and reddish lines, finely gritty under the teeth; taste bitter, faintly astringent, and aromatic; odour peculiar.

The chief constituents of rhubarb are—a volatile oil in minute quantity; *Chrysophanic acid;* three acid resins, termed *Aporetine, Phæoretine,* and *Erythroretine;* tannic and gallic acids; bitter extractive, crystallized oxalate of lime, starch, sugar, &c. Rhubarb is frequently adulterated, and good and bad varieties are often mixed. The inferior kinds may be known by the brown specks and cavities, and the boracic acid test will detect the presence of turmeric powder, which is often rubbed over inferior kinds of rhubarb to give them a better appearance. *Dose,* 5 to 40 grains.

EXTRACTUM RHEI—Extract of Rhubarb.—*Take of rhubarb root, sliced or bruised,* 1 *pound; rectified spirit,* 10 *fluid ounces; distilled water,* 5 *pints. Mix the spirit and the water, and macerate the rhubarb in the mixture for four days; then decant, press, and set by, that the undissolved matter may subside; pour off the clear liquor, filter the remainder, mix the liquors, and evaporate by a water-bath at a temperature not exceeding* 160°, *until the extract has acquired a suitable consistence for forming pills. Dose,* 5 *to* 20 *grs.*

INFUSUM RHEI—Infusion of Rhubarb.—*Take of rhubarb root, in thin slices,* ½ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* ℥ss. to ℥ii.

PILULA RHEI COMPOSITA—Compound Rhubarb Pill.—*Take of rhubarb root, in powder,* 3 *ounces; socotrine aloes, in powder,* 2¼ *ounces; myrrh, in powder, hard soap, in powder, of each,* 1½ *ounce; oil of peppermint,* 1½ *fluid drachm; treacle, by weight,* 4 *ounces. Mix the powders with the oil, then add the treacle, and beat the whole into a uniform mass. Dose,* 5 *to* 20 *grs.*

PULVIS RHEI COMPOSITUS—Compound Powder of Rhubarb.—*Take of rhubarb root, in powder,* 2 *ounces; light magnesia,* 6 *ounces; ginger, in powder,* 1 *ounce. Mix them thoroughly, and pass the powder through a fine sieve. Dose,* 5 *to* 60 *grs.*

SYRUPUS RHEI—Syrup of Rhubarb.—*Take of rhubarb root in coarse powder, coriander fruit, in coarse powder, of each,* 2 *ounces; refined sugar,* 24 *ounces; rectified spirit,* 8 *fluid ounces; distilled water,* 24 *fluid ounces. Mix the rhubarb and coriander; pack them in a percolator; pass the spirit and water, previously mixed, slowly through them; evaporate the liquid that has thus passed until it is* *reduced to thirteen fluid ounces, and in this, after it has been filtered, dissolve the sugar with a gentle heat. Dose,* ʒi. *to* ℥iv.

TINCTURA RHEI—TINCTURE OF RHUBARB.—*Take of rhubarb root, in coarse powder,* 2 *ounces; cardamom seeds, freed from the pericarps and bruised, coriander fruit, bruised, saffron, of each,* ½ *ounce; proof spirit,* 1 *pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ℥i.

VINUM RHEI—WINE OF RHUBARB.—*Take of rhubarb root, in coarse powder,* 1½ *ounce; cannella alba bark, in coarse powder,* 60 *grains; sherry,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation; then strain, press, filter, and add sufficient sherry to make one pint. Dose,* ʒi. *to* ℥i.

*Therapeutics.*—Rhubarb acts as an astringent, tonic, stomachic, and purgative. In small doses it acts as a tonic, improving the digestion; for this purpose it enters into the composition of most *dinner pills.* In larger doses it is purgative, acting chiefly by increasing the peristaltic action of the bowels throughout their entire extent, but especially in the duodenum, rather than by increasing the secretions of the alimentary canal. Rhubarb acts secondarily as an astringent, causing constipation after its purgative effects have passed off. The colouring matter of rhubarb is taken into the circulation and passes out by the urine, which, if it be alkaline at the time, is apt to assume a deep red colour, which might be mistaken for hæmaturia. Rhubarb is an excellent purgative for children when there is much irritation of the alimentary canal, for it first eliminates irritating matters, and then by its astringency prevents subsequent diarrhœa. For adults this tendency to cause constipation renders it objectionable as an ordinary laxative, but it is useful in diarrhœa, dysentery, &c., and may be combined with other drugs, as in the compound pill and powder, so as to answer a variety of purposes.

**LAURACEÆ**—The Laurel Order.—Trees, inhabiting tropical regions. The plants are aromatic and fragrant, yielding fixed and volatile oils, and camphor. Officinal plants: *Sassafras officinale, Camphora officinarum, Cinnamomum zeylanicum, Nectandra Rodiæi.*

**Sassafras Radix**—Sassafras Root.—Officinal plant: *Sassafras officinale;* the Sassafras Tree. Officinal part: The dried root, from North America.

*Characters.*—In branched pieces, sometimes eight inches in diameter at the crown; bark externally greyish-brown, internally rusty-brown, of an agreeable odour, and a peculiar aromatic warm taste; wood light, porous, greyish-yellow, more feeble in odour and taste than the bark. Also in chips.

The chief constituents of the root are a peculiar principle termed *Sassafrin,* heavy and volatile oils, tannin, resin, extractive, gum, albumen, &c. Volatile oil of sassafras is of a light yellow colour, has a pungent taste, and the odour of sassafras.

*Therapeutics.*—Sassafras acts as a stimulating diaphoretic, but is not uniform in its effects; the oil acts as an aromatic stimulant, and may be given in doses of two to eight or ten minims. Sassafras chips may be made into an infusion, but it is seldom given alone. It enters into the compound decoction of sarsaparilla.

**Camphora**—Camphor.—Officinal plant: *Camphora officinarum,* the Camphor Laurel. Officinal part: a concrete volatile oil, obtained from the wood by sublimation, and resublimed in bell-shaped masses; imported from China.

*Characters of Camphor.*—White, translucent, tough, and crystalline; has a powerful, penetrating odour and a pungent taste, followed by a sensation of cold; floats on water; volatilises slowly at ordinary temperatures; is slightly soluble in water, but readily soluble in rectified spirit and in ether. Sublimes entirely when heated. *Dose,* 1 to 10 grains.

Camphor is obtained from the root, trunk, and branches of the tree, by boiling the chips in water, and collecting the camphor as it sublimes into an earthen capital. In this state it constitutes *crude* camphor. It is afterwards purified by resublimation into glass vessels, quicklime being previously mixed with it to withhold the impurities. It occurs in hemispherical cakes, about three inches in thickness. It is tough and difficult to powder, unless a little rectified spirit be added. It floats on water, its specific gravity being ·98 to ·99. It volatilises slowly at the ordinary temperature of the atmosphere, and crystallizes on the walls of the vessels in which it is kept. It is regarded as a solid volatile oil, having the constitution $C_{10}H_{16}O$.

AQUA CAMPHORÆ—Camphor Water.—Mistura Camphoræ, *Lond., Edin., Dub.—Take of camphor, broken into pieces, ½ ounce; distilled water, 1 gallon. Enclose the camphor in a muslin bag, and attach this to one end of a glass rod, by means of which it may be kept at the bottom of a bottle containing the distilled water, the other end of the rod terminating just below the stopper of the bottle. Having thus put the camphor into the water, close the mouth of the bottle, macerate for at least two days, and then pour off the solution when it is required. Dose,* ℥i. *to* ℥ii.

LINIMENTUM CAMPHORÆ—Liniment of Camphor.—*Take of camphor, 1 ounce; olive oil, 4 fluid ounces. Dissolve the camphor in the oil.*

LINIMENTUM CAMPHORÆ COMPOSITUM — Compound Liniment of Camphor.—*Take of camphor, 2½ ounces; oil of lavender, 1 fluid drachm; strong solution of ammonia, 5 fluid ounces; rectified spirit, 15 fluid ounces. Dissolve the camphor and oil of lavender in the spirit; then add the solution of ammonia gradually, shaking them together until a clear solution is formed.*

SPIRITUS CAMPHORÆ — Spirit of Camphor. — *Take of camphor, 1 ounce; rectified spirit, 9 fluid ounces. Dissolve.*

TINCTURA CAMPHORÆ COMPOSITA — Compound Tincture of Camphor.—Tinctura Camphoræ cum Opio, 1864; Tinctura Opii Camphorata, *Edin., Dub.—Take of opium, in coarse powder, benzoic acid, of each, 40 grains; camphor, 30 grains; oil of anise, ½ fluid drachm; proof spirit, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation, then filter, and add sufficient proof spirit to make one pint. A half fluid ounce contains one grain of opium.*

*Therapeutics.*—Camphor in small doses (gr. ii.—v.—x.) acts as a stimulant, increases the action of the heart and arteries, exhilarates the spirits, and produces increase of the temperature of the body, and excites diaphoresis. The pulse is made softer and fuller. But these effects are speedily followed by symptoms of depression. In doses somewhat larger, it is antispasmodic, anodyne, and hypnotic. In large doses, it is a narcotico-irritant poison, producing delirium, vertigo, and convulsions, acting chiefly on the nervous system. Camphor also acts slightly upon the genito-urinary system as a sedative.

Therapeutically, camphor is employed as a stimulant, sedative, anodyne, antispasmodic, diaphoretic, anaphrodisiac. As a *stimulant*, in typhus and typhoid fevers, and in low febrile conditions generally;

in asthenic inflammations; to promote the reappearance of exanthemata; in summer diarrhœa and cholera; and locally, as a lotion or liniment to bed-sores, sprained joints, &c., &c. As a *sedative*, in the delirium of fever, accompanied by depression of nervous energy and of the vital powers. In such cases it needs to be given in large doses (gr. xx. every two hours). In delirium tremens, associated with great exhaustion, when, from the general condition, morphia seems inadmissible. It should be given in doses of two to three grains every third hour. In irritable conditions of the nasal mucous membrane, with much sneezing and frontal headache (RINGER); in insanity, in puerperal mania, in uterine irritability, in chordee, in cases of poisoning from irritant substances, which act specifically upon the genito-urinary organs, such as cantharides, squills, &c. As an *antispasmodic*, it is administered in asthma, emphysema, and in chronic coughs generally; in hysteria. As an *anodyne*, it is applied externally in neuralgic headache, in painful burning skin eruptions, in chronic eczema, and prurigo; as a liniment to the pains in the loins of pregnant women; to relieve the after-pains of labour; also in pruritus muliebrium, in toothache, &c. As a *diaphoretic*, it is not very active, but is a useful adjunct to other diaphoretics. As an *anaphrodisiac*, in nymphomania and spermatorrhœa. It exerts a sedative effect upon the genital organs when administered in large doses. Camphor may be given in pill or emulsion, dose 2-20 grs., the former is, however, objectionable, as it is apt to irritate the stomach, or it may be given in new milk, which dissolves an eighth of its weight, ʒi. in ℥iv., and the solution is soluble in water without precipitation of the camphor. Of the officinal preparation the aqua contains too little camphor to produce any effect, while the spirit is too irritating, hence should only be used externally.

**Cinnamomi Cortex**—Cinnamon Bark.—Officinal plant: *Cinnamomum zeylanicum*, Ceylon Cinnamon. Officinal parts:—1. The inner bark of shoots from the truncated stock; imported from Ceylon, and distinguished in commerce as Ceylon cinnamon. 2. *Oleum Cinnamomi*, Oil of Cinnamon; the oil distilled from cinnamon; imported from Ceylon.

*Characters of Cinnamon.*—About one-fifth of a line thick, in closely-rolled quills, which are about four lines in diameter, containing several small quills within them, light yellowish-brown, with a fragrant odour and warm sweet aromatic taste; breaks with a splintery fracture.

*Characters of the Oil.*—Yellowish when recent, gradually becoming red, having the odour and taste of cinnamon. Sinks in water. *Dose*, 1 to 5 mins.

Cinnamon contains, besides its volatile oil, tannin, resin, colouring matter, &c. The essential part of the volatile oil (Hyduret of Cinnamyle), by exposure to the air, combines with oxygen, and is converted into cinnamic acid and two peculiar resins and water. The bark and volatile oil of cassia (*Chinese Cinnamon*, so-called) are frequently substituted for those of cinnamon. The false bark is thicker, and the false oil is less fragrant and more acrid and burning.

AQUA CINNAMOMI—Cinnamon Water.—*Take of cinnamon, bruised*, 20 *ounces; water*, 2 *gallons. Distil one gallon. Dose*, ℥i. *to* ℥ii.

PULVIS CINNAMOMI COMPOSITUS—Compound Powder of Cinnamon.—Pulvis Aromaticus, *Edin.*—*Take of cinnamon bark, in powder, cardamom seeds, in powder, ginger, in powder, of each*, 1 *ounce. Mix them thoroughly, pass the powder through a fine sieve, and finally, rub it lightly in a mortar. Keep it in a stoppered bottle. Dose*, 5 *to* 30 *grains.*

TINCTURA CINNAMOMI—Tincture of Cinnamon.—*Take of cinnamon bark, in coarse powder*, 2½ *ounces; proof spirit*, 1 *pint. Macerate the cinnamon for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose*, ʒss. *to* ʒii.

*Therapeutics.*—Cinnamon acts as a mild stimulant, carminative, astringent, and antispasmodic. Its preparations are used as adjuncts to, or vehicles for, more potent remedies, to produce a slightly stimulant action, to impart flavour, or correct irritating and griping qualities. The bark, volatile oil, and other preparations of cassia, which were formerly officinal, may be used in the same doses, and for the same purposes, as true cinnamon and its preparations.

**Nectandræ Cortex** — Bebeeru Bark. — Officinal plant: *Nectandra Rodiæi*, the Bebeeru or Greenheart Tree. Officinal part: The bark; imported from British Guiana.

*Characters of the Bark.*—In large flat heavy pieces, from one to two feet long, from two to six inches broad, and about a quarter of an inch thick. External colour, greyish-brown, internal, dark cinnamon-brown. Taste, strongly and persistently bitter, with considerable astringency.

Bebeeru Bark contains a peculiar bitter alkaloid, *Beberia*, and besides that, tannic acid and other constituents. Beberia is uncrystallizable, and occurs either as a yellow amorphous resinoid substance, or as a white powder. It is but little soluble in water, more so in ether, and readily so in alcohol. It was discovered by Mr. Rodie, R.N. (hence the name of the species, Rodiæi), and was subsequently investigated by Dr. Douglas Maclagan, of this city. According to Walz and Flückiger this alkaloid is undistinguishable from Buxine, from Buxus Sempervirens, and Pelosine, from Pareira brava root.

BEBERIÆ SULPHAS—SULPHATE OF BEBERIA ($C_{35}H_{40}N_2O_6H_2SO_4$).—*The sulphate of an alkaloid prepared from nectandra or bebeeru bark.*

PREPARATION.—*Take of bebeeru bark, in coarse powder,* 1 *pound; sulphuric acid,* ½ *fluid ounce; slaked lime,* ¾ *ounce, or a sufficiency; solution of ammonia, a sufficiency; rectified spirit,* 16 *fluid ounces, or a sufficiency; diluted sulphuric acid, a sufficiency; water,* 1 *gallon; distilled water, a sufficiency. Add the sulphuric acid to the water, pour upon the bebeeru bark enough of this mixture to moisten it thoroughly; let it macerate for twenty-four hours, place it in a percolator, and pass through it the remainder of the acidulated water. Concentrate the acid liquor to the bulk of one pint, cool, and add gradually the lime in the form of milk of lime, agitating well, and taking care that the fluid still retains a distinct acid reaction. Let it rest for two hours, filter through calico, wash the precipitate with a little cold distilled water, and to the filtrate add solution of ammonia until the fluid has a faint ammoniacal odour. Collect the precipitate on a cloth, wash it twice with ten ounces of cold water, squeeze it gently with the hand, and dry it by the heat of a water-bath. Pulverise the dry precipitate, put it into a flask with six ounces of the rectified spirit, boil, let it rest for a few minutes, and pour off the spirit. Treat the undissolved portion in a similar manner with fresh spirit until it is exhausted. Unite the spirituous solutions, add to them four ounces of distilled water, and distil so as to recover the greater part of the spirit. To the residue of the distillation add by degrees, and with constant stirring, diluted sulphuric acid, till the fluid has a slight acid reaction. Evaporate the whole to complete dryness on the water-bath, pulverise the dry product, pour on it gradually one pint of cold distilled water, stirring diligently; filter through paper, evaporate the filtrate to the consistence of a syrup, spread it in thin layers on flat porcelain or glass plates, and dry it at a heat not exceeding* 140°. *Preserve the product in stoppered bottles.*

*Characters.*—In dark-brown, thin, translucent scales, yellow when in powder, with a strong bitter taste, soluble in water and in alcohol. Its watery solution gives a white precipitate with chloride of barium; and with caustic soda a yellowish-white precipitate, which is dissolved by agitating the mixture with twice its volume of ether. The ethereal solution, separated by a pipette and evaporated, leaves a yellow translucent residue, entirely soluble in dilute acids. *Dose*, 1 to 5 grains as a tonic, and 10 to 20 grains as an antiperiodic, dissolved in a little sulphuric acid.

*Therapeutics.*—Sulphate of beberia was introduced by Dr. Maclagan as a substitute for quinine, the properties of which it is said to possess, with the advantage of being less liable to produce the excitement and other symptoms of cinchonism or quinism. It is used as a tonic, antiperiodic, and febrifuge in the same cases as quinine. Extended trials of this medicine, however, have been disappointing, as it appears to have no action on the nervous system; in fact, it is only a bitter tonic, its action being purely a local one on the gastric mucous membrane.

**MYRISTICACEÆ**—The Nutmeg Order.—Tropical trees possessing acrid and aromatic properties. Officinal plant: *Myristica officinalis.*

**Myristica**—Nutmeg.—Officinal plant: *Myristica officinalis*, the Nutmeg Tree. Officinal parts:—1. The kernel of the seed; imported from Sumatra and the Molucca Islands. 2. *Oleum Myristicæ expressum*, or *Adeps Myristicæ*, Expressed Oil of Nutmeg; a concrete oil obtained by means of expression and heat from nutmegs. 2. *Oleum Myristicæ*, Volatile Oil of Nutmeg; the oil distilled in Britain from nutmeg.

*Characters of the Nutmeg.*—Oval or nearly round, about an inch in length, marked externally with reticulated furrows, internally greyish-red with dark-brownish veins. It has a strong peculiar odour, and a bitter aromatic taste.

*Characters of the Expressed Oil.*—Of an orange colour, firm consistence, and fragrant odour, like that of nutmeg.

*Characters of the Volatile Oil.*—Colourless or straw-yellow, having the odour and taste of nutmegs. *Dose*, 1 to 5 minims.

SPIRITUS MYRISTICÆ—SPIRIT OF NUTMEG.—*Take of volatile oil of nutmeg*, 1 *fluid ounce; rectified spirit*, 49 *fluid ounces. Dissolve. Dose*, ʒss. *to* ʒi.

*Therapeutics.*—Nutmegs and mace are both used as stimulating and flavouring condiments or spices. Medicinally, the volatile oil and the spirit are used as carminative and flavouring adjuncts to other remedies, and they act of themselves as mild aromatic stimulants. Externally, they operate as topical stimulants, and the fixed oil has been thus used in chronic rheumatism and other local pains, and in paralysis. In large doses the oil has narcotic properties.

**THYMELACEÆ**—The Mezereon Order.—Shrubby plants, generally distributed. The plants possess acrid, irritant, and occasionally narcotic properties. Officinal plant: *Daphne Mezereum*, *D. Laureola.*

**Mezerei Cortex**—Mezereon Bark.—Officinal plants:—1. *Daphne Mezereum*, Mezereon. 2. *Daphne Laureola*, Linn.; Spurge Laurel. Officinal part: The bark, dried.

*Botany.—Daphne Mezereum* is a small shrub, with lanceolate, smooth, evergreen, deciduous leaves; pale, rose-coloured, fragrant flowers, arranged in a spike-like manner, and appearing before the leaves; and a bright-red, fleshy, one-seeded berry. *Daphne Laureola* has a smooth, erect stem, one to three feet high; lanceolate, glabrous, evergreen leaves; green flowers, arranged in axillary racemes; and an oval bluish-black berry. *Habitat*, indigenous.

*Characters of the Bark.*—In strips or quilled pieces of various lengths, tough or pliable, olive-brown on the surface, white within, fibrous, odour faintly nauseous, taste hot and acrid.

EXTRACTUM MEZEREI ÆTHEREUM—Ethereal Extract of Mezereon.

PREPARATION.—*Take of mezereon bark, cut small,* 1 *pound; rectified spirit,* 8 *pints; ether,* 1 *pint. Macerate the mezereon in six pints of the spirit for three days, with frequent agitation. Strain and press. To the residue of the mezereon add the remainder of the spirit, and again macerate for three days, with frequent agitation. Strain and press. Mix and filter the strained liquors. Recover the greater part of the spirit by distillation. Evaporate what remains to the consistence of a soft extract. Put this into a stoppered bottle with the ether, and macerate for twenty-four hours, shaking them frequently. Decant the ethereal solution. Recover part of the ether by distillation, and evaporate what remains to the consistence of a soft extract.*

*Therapeutics.*—Mezereon acts in over-doses as an acrid poison, and topically as a powerful irritant, the bark causing vesication when moistened and bound upon the skin. Internally, it acts as a stimulating diaphoretic and alterative, and is useful in rheumatic and venereal diseases. It is seldom given alone, but enters into the compound decoction of sarsaparilla. A few grains of the bark chewed act as a masticatory.

**ARISTOLOCHIACEÆ**—The Birthwort Order.—Herbs or climbing shrubby plants, widely distributed, but chiefly in tropical South America. The plants possess pungent, aromatic, stimulant, and tonic properties. Officinal plant: *Aristolochia Serpentaria.*

**Serpentariæ Radix**—Serpentary Root.—Officinal plant: *Aristolochia Serpentaria,* Virginian Snake Root. Officinal part: The dried rhizome; from the southern parts of North America.

*Characters.*—A small roundish rhizome, with a tuft of numerous slender rootlets, about three inches long, yellowish, of an agreeable camphoraceous odour, and a warm, bitter, camphoraceous taste.

Serpentary contains a volatile oil, bitter extractive, resin, &c., and yields its active principle both to water and alcohol.

INFUSUM SERPENTARIÆ—INFUSION OF SERPENTARY.—*Take of serpentary root, bruised,* ½ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for two hours, and strain. Dose,* ℥i. *to* ℥ii.

TINCTURA SERPENTARIÆ—TINCTURE OF SERPENTARY.—*Take of serpentary root, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the serpentary for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒii.

*Therapeutics.*—Serpentary was formerly a good deal used in this country, and is still largely employed in America, as a general stimulant in debilitating and depressing diseases, but it is scarcely at all used here now. It was also employed as a tonic and emmenagogue.

**EUPHORBIACEÆ**—The Spurgewort Order.—Trees, shrubs, or herbs, occasionally in North America, Africa, India, and Europe; abounding in Equinoctial America. The plants furnish a milky juice, a starchy matter, oils, and caoutchouc. They are generally acrid and poisonous. Officinal plants: *Croton Eluteria, Croton Tiglium, Ricinus communis, Rottlera tinctoria.*

**Cascarillæ Cortex**—Cascarilla Bark.—Officinal plant: *Croton Eluteria,* Bahama Cascarilla. Officinal part: The bark; from the Bahama Islands.

*Characters of the Bark.*—In quills, two or three inches in length, and from two to five lines in diameter; dull-brown, but more or less coated with white crustaceous lichens; breaks with a short resinous fracture; is warm and bitter to the taste; and emits a fragrant odour when burned.

Besides other constituents, the bark contains a bitter crystallizable principle, termed *Cascarillin,* a volatile oil, resin, red colouring matter, &c. The bark yields its active principles, cascarillin and volatile oil, to spirit, and partially to water.

INFUSUM CASCARILLÆ—INFUSION OF CASCARILLA.—*Take of cascarilla bark, in coarse powder,* 1 *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for one hour, and strain. Dose,* ℥i. *to* ℥iii.

TINCTURA CASCARILLÆ—TINCTURE OF CASCARILLA.—*Take of cascarilla bark, bruised,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the cascarilla for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ʒii.

*Dose.*—Of the powdered bark, ten to thirty grains.

*Therapeutics.*—Cascarilla acts as a non-astringent aromatic bitter tonic. It has been proposed, as a substitute for cinchona bark, as a tonic and febrifuge. Its preparations are commonly used as aromatic and tonic adjuncts to other medicines, in atonic dyspepsia, in convalescence from exhausting diseases, in chronic bronchial complaints, in chronic diarrhœa, and dysentery, &c.

**Oleum Crotonis**—Croton Oil.—Officinal plant: *Croton Tiglium,* Croton Oil plant. Officinal part: The oil, expressed from the seeds.

*Characters.*—Slightly viscid; colour brownish-yellow, taste acrid, odour faintly nauseous. Agitated with its own volume of alcohol, and gently heated, it forms a clear solution, from which about three-fourths of the oil separate on cooling. *Dose,* ½ *min. to* 3 *mins.*

*Croton seeds* are oval, about six lines in length, three in thickness, and three or four in breadth; externally they are of a brownish-black colour, more or less mottled, by the removal of portions of the outer covering or testa. The seeds are inodorous, but their taste, though at first mild and oleaginous, becomes acrid and burning. They contain a pale yellowish-white oily albumen, which surrounds the embryo. Croton Oil (*Oleum Tiglii*) is obtained by bruising the kernels, and subjecting them to pressure. In addition to other constituents, the oil contains *Crotonic acid*, which was formerly supposed to be its active principle, but the researches of Dr. Pereira and Mr. Redwood lead to the supposition that it is inactive.

LINIMENTUM CROTONIS—LINIMENT OF CROTON OIL.—*Take of croton oil, 1 fluid ounce; oil of cajuput, rectified spirit, of each, 3½ fluid ounces. Mix.*

*Therapeutics.*—Croton oil in over-doses acts as an irritant poison. In medicinal doses of half, one, two, or three drops it is a prompt drastic cathartic, operating freely in an hour or two after its administration. It occasionally fails, but it usually procures several watery evacuations, and causes considerable depression of the vital powers. It is employed as an internal remedy in those cases in which an immediate action of the bowels is imperative, and in cases in which, from inability or obstinate refusal to swallow, the patient is unable or unwilling to take a solid drug, or one in any form in large quantity. It is given to overcome obstinate constipation, in dropsies, in nervous diseases, and to act as a derivative in head cases. Although so powerful a purgative, it does not frequently cause nausea or griping, but in some cases it produces severe hypercatharsis, and has been known to induce intussusception of the bowels. It is uncertain in its action, sometimes operating severely in small doses, at other times very slightly even when given in full doses. In consequence of its acrid and depressing qualities, it is contra-indicated in inflammatory affections of the alimentary canal and in cases of debility. When rubbed upon the skin, croton oil produces redness and inflammation, followed by a pustular eruption; it operates, therefore, as a counter-irritant, and is useful in a variety of inflammatory affections of internal organs. When rubbed upon the abdomen it sometimes produces its purgative effects. When applied externally, it occasionally produces an erysipelatous inflammation, and it is better not to apply it to exposed parts, such as the face and neck. It is best given in pill, with confection of roses, or added to a purgative pill mass, or in a solution of castor oil. Treatment of an over-dose, opiates and demulcents.

**Oleum Ricini**—Castor Oil.—Officinal plant: *Ricinus communis*, Castor Oil Plant. Officinal part: The oil, expressed from the seeds, or imported; chiefly from Calcutta.

*Botany.*—Fruit, a three-celled prickly capsule, with one seed in each cell. The seeds are oval, about four lines long, three lines broad, and a line and a-half thick; they are externally pale grey, marbled with darker spots and stripes. The seed-coat is smooth, thin coriaceous, and divisible into two layers, an outer testa, comparatively thick and hard, and an internal membrane. The nucleus of the seed is large, fleshy, and oleaginous, and consists of albumen, in which is imbedded the large leafy embryo. *Habitat*, India; cultivated elsewhere.

*Characters of the Oil.*—Viscid, colourless, or pale straw-yellow, having a slightly nauseous odour, and a somewhat acrid taste. Entirely soluble in one volume of alcohol, and in two volumes of rectified spirit.

The seeds yield about one-third of their weight of oil, or rather less, about twenty-five to thirty per cent. Castor oil is chiefly imported from the East Indies and from America; it is also obtained from the West Indies, and some is prepared in this country. When it is obtained by simple expression, it is termed *cold drawn* castor oil, and that is the finer variety. The purer kinds of oil are pale yellow, and have a disagreeable, tenacious, oily taste and unpleasant odour; the inferior kinds are darker in colour, and still more offensive in odour and taste. Castor oil is soluble in ether and in cold alcohol; when exposed to the atmosphere it thickens and congeals, without becoming opaque, but it turns rancid by the exposure. It is said to be made up of ricinoleine (which consists of ricinoleic acid ($C_{18}H_{34}O_2$), in combination with glycerine), and an acrid resin. Castor oil may be rancid and acrid, either from faulty preparation or from being carelessly kept, but it is seldom adulterated.

*Dose.*—From one or two fluid drachms for an infant, to one or two fluid ounces for an adult. It may be given either alone, or as an emulsion with yolk of an egg or mucilage, in a little brandy, or in warm milk, coffee, aromatic water, &c. It should always be gently warmed before it is taken.

*Therapeutics.*—Castor oil acts as a mild non-stimulating purgative, and produces its effects by whatever channel it is introduced into the system, whether by the mouth, the rectum, or by injection into a vein. It causes little or no constitutional disturbance, and therefore is useful as a laxative after surgical operations, after parturition, in pregnancy, in inflammatory affections of the abdominal and pelvic viscera, and in other circumstances in which repose is imperative. It is a safe remedy for children and debilitated persons, as it does not cause much depression or irritation, unless it be rancid, when it may, from its acridity, give rise to severe diarrhœa. There are many persons, however, who cannot tolerate castor oil in any form, even when most skilfully disguised.

**Kamala**—Kamala.—Officinal plant; *Rottlera tinctoria.* Officinal part: a powder, which consists of the minute glands which cover the capsules; imported from India.

*Characters.*—A fine granular mobile powder, of a brick-red colour; it is with difficulty mixed with water, but when boiled with alcohol, the greater part is dissolved, forming a red solution. Ether dissolves most of it; the residue consisting principally of tufted hairs. It should be free from sand or earthy impurities.

Kamala occurs as a brick-red powder, which, when examined microscopically, is found to consist of roundish, semi-transparent granules, of one two hundredth and fiftieth to one five hundredth of an inch in diameter, mixed with stellate hairs. It has but little odour or taste, is scarcely soluble in boiling, and not at all in cold, water, but forms a deep red solution with alkalies, and is soluble in ether and in alcohol. As analysed by Anderson and Leube it consists of 80 per cent. of resin, which is the active principle and colouring matter termed *Rottlerin.*

*Therapeutics.*—Kamala is employed in India under the names of *Kamala, Reroo,* and *Wurrus,* both as a dye-stuff and as a vermifuge. It has not yet been much employed in this country. It acts as a purgative, causing more or less of nausea and griping; but its chief medicinal value resides in its vermifuge properties, on account of which it is employed for the removal of tænia solium. The dose is from 30 grains to half-an-ounce in syrup or gruel, or a tincture made by macerating 8 ounces of the powder in 20 ounces of rectified spirit. *Dose,* ʒi. to ʒiv.

**URTICACEÆ**—The Nettle and Hemp Order.—Trees, shrubs, or herbs. The order is divided into two sub-orders:—1. *Urticeæ,* Nettleworts, the true Nettles, which are universally distributed; and 2. *Cannabineæ,* Hempworts, the Hemp and Hop tribe, natives chiefly of temperate regions. The plants possess tonic, narcotic, and other properties. Officinal plants: *Humulus Lupulus, Cannabis sativa,* both belonging to the sub-order *Cannabineæ.*

**Lupulus**—Hop.—Officinal plant: *Humulus Lupulus;* the Hop. Officinal part: The dried strobiles of the female plant; cultivated in England.

*Botany.—Root*, perennial. *Stems*, annual, long, weak, pliable, climbing, scabrous. *Leaves*, opposite, on long, often winding petioles, three to five lobed, sharply serrated, rough. *Flowers*, numerous, diœcious, greenish-yellow; male flowers in loose panicles, female flowers in catkins or strobiles, male and female flowers on separate plants. *Habitat*, indigenous, various parts of Europe, cultivated in the south of England.

*Characters.*—Strobiles of a greenish-yellow colour, with minute yellow grains (Lupuline) adherent to the base of the scales. Odour aromatic, taste bitter.

The scales of the catkin are thin, membraneous, veined, and covered with numerous superficial yellow, shining, roundish glands, which are variously termed *lupulinic grains* or *glands*, *lupulin* or *yellow powder*. Hops have an agreeable odour, and a bitter taste, produced by the glands. The catkins are gathered in September, and dried in kilns. The glands contain, beside other ingredients, a volatile oil, and a bitter principle, termed *lupulite*, and resin. The volatile oil, according to Personne, is chemically analogous to oil of valerian. The scales contain tannin.

EXTRACTUM LUPULI—Extract of Hop.—*Take of hop*, 1 *pound; rectified spirit*, 1½ *pint; distilled water*, 1 *gallon. Macerate the hop in the spirit for seven days, press out the tincture, filter, and distil off the spirit, leaving a soft extract. Boil the residual hop with the water for one hour, press out the liquor; strain, and evaporate by a water-bath to the consistence of a soft extract. Mix the two extracts, and evaporate at a temperature not exceeding* 140°, *until it has acquired a suitable consistence for forming pills. Dose*, 5 *to* 20 *grains.*

INFUSUM LUPULI—Infusion of Hop.—*Take of hop*, ½ *ounce; boiling distilled water*, 10 *fluid ounces. Infuse in a covered vessel for two hours, and strain. Dose*, ℥i. *to* ℥ii.

TINCTURA LUPULI—Tincture of Hop.—*Take of hop*, 2½ *ounces; proof spirit*, 1 *pint. Macerate the hop for forty-eight hours in fifteen fluid ounces of the spirit, in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose*, ʒi. *to* ʒiii.

*Therapeutics.*—The aroma of hops is said to act as a narcotic, and in order to procure this effect, in certain cases of nervous restlessness, or maniacal watchfulness and insomnia, the patient is made to rest the head upon a pillow stuffed with catkins. As an internal remedy, hops are probably not narcotic. Lupulin is said to be somewhat of a narcotic, and anodyne in a dose of 5 to 10 grains. The officinal preparations act as mild aromatic tonics and stomachics. Hops and their preparations have been used, both internally and by local application, to procure sleep or to relieve pain, in mania, in delirium, in rheumatism, in cancer, in painful tumours and ulcerations, in dyspepsia, in gouty spasm of the stomach, &c.

**Cannabis Indica**—Indian Hemp.—Officinal plant: *Cannabis sativa;* Hemp. Officinal part: The flowering tops of the female plant from which the resin has not been removed, dried; cultivated in India.

*Characters.*—Tops consisting of one or more alternate branches, bearing the remains of the flowers and smaller leaves, and a few ripe fruits, pressed together in masses, which are about two inches long, harsh, of a dusky-green colour, and a characteristic odour.

*Cannabis indica* occurs in three forms, *Gunjah, Churrus,* and *Bang, Gunjah* is the entire plant, cut during inflorescence, with the resin carefully preserved on the leaves; it is exposed to the sun for three days, and then made into bundles about two feet long, each containing twenty-four plants. *Churrus* consists simply of the resin obtained from the leaves, slender stems, and flowers. It is obtained in different ways: either by rubbing the leaves carefully between the palms of the hands and scraping the soft resin from them when enough has adhered; by rubbing the leaves gently with a cloth, and scraping the resin off it. *Bang* consists of a mixture of the leaves and capsules without the stalks. The active principle of the plant is the resin, sometimes called *Cannabin;* there is also a small quantity of volatile oil. The resin is of dark green colour, has a fragrant odour, a warm, acrid, and bitter taste, and is soluble in alcohol and in ether, and in the fixed and volatile oils.

EXTRACTUM CANNABIS INDICÆ—EXTRACT OF INDIAN HEMP.—*Take of Indian hemp, in coarse powder,* 1 *pound; rectified spirit,* 4 *pints. Macerate the hemp in the spirit for seven days, and press out the tincture. Distil off the greater part of the spirit and evaporate what remains by a water-bath to the consistence of a soft extract. Dose,* ½ *to* 2 *grains.*

TINCTURA CANNABIS INDICÆ — TINCTURE OF INDIAN HEMP.—*Take of extract of Indian hemp,* 1 *ounce; rectified spirit,* 1 *pint. Dissolve the extract of hemp in the spirit. Dose,* 10 *minims to* ʒi.

*Therapeutics.*—Indian hemp is employed by the natives for the purpose of intoxication. Taken thus in large doses, it quickens the circulation and exhilarates the spirits, producing a kind of mirthful or extravagant delirium, during which its victim alternately laughs, cries, sings, dances, or craves for food, all the while believing himself to be in a normal state of mind. Sometimes, however, it makes its victim ill-tempered, violent, and pugnacious. It usually produces an inordinate appetite for food, and acts powerfully as an aphrodisiac. In medicinal doses it acts upon the cerebro-spinal system, causing, in moderate doses, exhilaration of spirits, a kind of inebriation and hallucination, followed by confusion of intellect and tendency to sleep; in large doses it causes stupor. After the primary effects of a full dose have passed off, the patient is said to be left in a state of catalepsy. *Cannabis indica* has been most frequently used in this country as a substitute for opium in cases in which the latter is not tolerated. It differs from opium in its effects, chiefly in not contracting the pupil, and in not causing loss of appetite, dry tongue, or constipation. The great drawback to its employment is its exceeding uncertainty of action, small doses in some cases causing marked symptoms, whilst in other instances full doses produce no effect, circumstances which depend, however, a good deal upon the purity of the drug. *Cannabis indica* has been used as an anodyne, hypnotic, antispasmodic, nervine stimulant, &c., and has been employed in tetanus, hydrophobia, chorea, infantile convulsions, delirium tremens, various forms of neuralgia, in headache with dull throbbing pain over one brow, usually the right one, gout, rheumatism, in low fevers, in hysteria, in asthma, in palpitation of the heart, in menorrhagia, in protracted labour depending upon an atonic state of the uterus, &c. It is contra-indicated in active inflammatory states, and the patient must be carefully watched during its exhibition, lest he should injure himself whilst mentally incapacitated by it, as sometimes happens. Antimonials, salines, a blister to the nape of the neck, &c., may be employed to control its violent action.

**ARTOCARPACEÆ**—The Bread-fruit or Mulberry Order.—Trees or shrubs. The order is divided into sub-orders:—1. *Artocarpeæ,* the Bread-fruit tribe, natives of the tropics. 1. *Moreæ,* the Mulberry and fig tribe, inhabiting tropical and temperate climates.

Many of the plants of the order furnish edible fruits; they possess bitter, tonic, acrid, and poisonous properties. Officinal plants: *Morus nigra*, *Ficus carica.*

**Mori Succus**—Mulberry Juice.—Officinal plant: *Morus nigra;* the Common Mulberry. Officinal part: The juice of the ripe fruit.

*Botany.*—A tree twenty to thirty feet high. *Leaves*, alternate, cordate, lobed, coarsely serrated, pubescent. *Flowers*, greenish, monœcious; male flowers in spikes; female flowers in small roundish or ovoid catkins. *Fruit*, dark purple, formed by the female flowers becoming fleshy and coherent, and including a dry membraneous one-seeded pericarp. *Habitat*, Persia and China; cultivated in Britain.

*Characters of the Juice.*—Of a dark violet colour, with a faint odour, and an acidulous sweet taste.

SYRUPUS MORI—Syrup of Mulberries.—*Take of mulberry juice*, 1 *pint; refined sugar*, 2 *pounds; rectified spirit*, 2½ *fluid ounces. Heat the mulberry juice to the boiling point, and when it has cooled filter it. Dissolve the sugar in the filtered liquid with a gentle heat, and add the spirit. The product should weigh three pounds six ounces, and should have the specific gravity* 1·33.

*Dose.*—Ad libitum, or *q.s.*

*Therapeutics.*—Mulberry juice is occasionally used as a refrigerant; in large doses it is laxative. The syrup is used to impart colour and flavour.

**Ficus**—Fig.—Officinal plant: *Ficus carica;* the Fig Tree. Officinal part: The dried fruit, imported from Smyrna.

*Characters.*—Compressed, soft but tough, brown, covered with a saccharine efflorescence, containing a viscid sweet pulp, and numerous small hard seeds.

*Therapeutics.*—Figs acts as emollients and demulcents, and in large quantity as laxatives. They are largely used as a dessert; they form an ingredient of confection of senna, and when split and toasted, they are occasionally used as a topical application to gum-boils.

**ULMACEÆ**—The Elm Order.—Trees or shrubs inhabiting northern countries. The plants possess bitter and astringent properties. Officinal plant: *Ulmus Campestris.*

**Ulmi Cortex**—Elm Bark.—Officinal plant: *Ulmus campestris;* the Broad-leaved Elm. Officinal part: The dried inner bark, deprived of its outer layers ; from trees indigenous to and cultivated in Britain.

*Botany.*—A tree of sixty to eighty feet in height, with a rugged bark. *Leaves,* alternate, broadly ovate, oblique at the base, scabrous above and pubescent beneath. *Flowers,* hermaphrodite, in dense heads, reddish-brown. *Habitat,* indigenous.

*Characters.* — A tough brownish-yellow bark, about half-a-line thick, without smell ; taste, mucilaginous, slightly bitter and astringent. Its decoction is turned green by perchloride of iron, and precipitates with a solution of gelatine.

The bark contains tannin 3 per cent., and mucilage 20 per cent., and a gummy principle, termed *Ulmin,* which is brown, and insoluble in water.

DECOCTUM ULMI—Decoction of Elm Bark.

PREPARATION.—*Take of elm bark, cut in small pieces,* 2½ *ounces; distilled water,* 1 *pint. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint. Dose,* ℥ii *to* ℥iv.

*Therapeutics.*—The decoction is the only officinal preparation of elm bark. It is the usual form of administering it. Elm bark is employed as an astringent and demulcent tonic and alterative, but chiefly for the sake of its action upon the skin. It is given in the chronic scaly skin diseases of debilitated persons, especially in ichthyosis, in which it is sometimes employed as a cheap substitute for sarsaparilla. It should be given in doses of from two to four fluid ounces.

**PIPERACEÆ**—The Pepper Order.—Shrubs or herbs, natives of tropical regions. The plants of this order contain an acrid resin, a volatile oil, and a crystalline substance ; they possess pungent, aromatic, astringent, and narcotic properties. Officinal plants: *Piper nigrum, Cubeba officinalis, Artanthe elongata.*

**Piper Nigrum**—Black Pepper.—Officinal plant: *Piper nigrum.* Officinal part: the dried unripe berries ; chiefly from the East Indies.

*Characters.*—Small, roundish, wrinkled ; tegument brownish-black, containing a greyish-yellow globular seed. Odour aromatic. Taste pungent and bitterish.

The berries are gathered before they are quite ripe, and are dried in the sun. White pepper is derived from the same fruit, the berries being first allowed to ripen, and then decorticated. Black pepper contains, besides other ingredients, a peculiar neutral, crystalline principle, termed *Piperin*, which, when quite pure, occurs in colourless rhombic prisms, is tasteless and inodorous. The berries contain also a volatile oil, which has the odour and taste of the fruit, and an acrid resin.

CONFECTIO PIPERIS—CONFECTION OF PEPPER.—*Take of black pepper, in fine powder, 2 ounces; caraway fruit, in fine powder, 3 ounces; clarified honey, 15 ounces. Rub them well together in a mortar. Dose, ʒi to ʒii.*

*Therapeutics.*—Pepper is largely used as a condiment. As a medicine, it acts as an acrid, aromatic, stimulant stomachic, and as a febrifuge. It acts also particularly upon the mucous membranes of the rectum and of the urinary organs. Externally, it acts as a rubefacient. It is useful as a stimulant stomachic condiment in atonic and torpid states of the stomach. It is given as a febrifuge in intermittent fever, a property which it owes to piperin, which may be given alone for that purpose, in doses of 5 to 10 grains, but it is only useful in mild or chronic cases, kept up by want of tone, or debility of the digestive organs, and so assists the action of quinine. Pepper is also used as a masticatory in paralysis of the tongue, relaxed uvula, and other affections of the mouth. The confection is employed in diseases of the rectum, such as hæmorrhoids, fistula, ulcers, &c. In order to afford any benefit it must be continued for two or three months. Pepper is contra-indicated in inflammatory conditions of the mucous membrane.

**Cubeba**—Cubebs.—Officinal plant: *Cubeba officinalis*, the Cubeb Pepper. Officinal parts:—1. The unripe fruit, dried; cultivated in Java. 2. *Oleum Cubebæ*, Oil of Cubebs; the oil distilled in England from cubebs.

*Characters of the Fruit.*—The size of black pepper, globular, wrinkled, blackish, supported on a stalk of rather more than its own length, has a warm, camphoraceous taste, and characteristic odour.

*Characters of the Oil.*—Colourless or pale greenish-yellow, having the peculiar odour and taste of cubebs. Cubebs contain *a volatile oil*, which is obtained by grinding the fruit and distilling it with water; its density is 0·929; *a resin;* and *cubebin*, which is probably identical with piperin, and may be obtained in small acicular crystals. *Dose*, of the oil, 10 to 30 mins.

TINCTURA CUBEBÆ—Tincture of Cubebs.—*Take of cubebs, in powder, 2½ ounces; rectified spirit, 1 pint. Macerate the cubebs for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose,* ℥ss. *to* ℥i.

*Therapeutics.*—Cubebs, like common pepper, act as an acrid and stimulant stomachic; in over-doses they cause griping and purging, with considerable febrile excitement. They act upon the mucous membranes generally, but especially upon the genito-urinary tract. They are chiefly employed in the treatment of gonorrhœa, given in full doses at the early stage of the disease. They are also occasionally used in other affections of the urinary organs, such as leucorrhœa cystorrhœa, abscess of the prostate gland, &c.; and also in those affections of the pulmonary mucous membrane in which there is profuse secretion. Except in gonorrhœa, in which they are given in doses of sixty to a hundred and twenty or more grains, they should be given in moderate doses, as from ten to thirty grains. They are apt to produce a cutaneous eruption resembling urticaria.

**Maticæ Folia**—Matico Leaves.—Officinal plant: *Artanthe elongata;* the Matico plant. (*Piper angustifolium.*) Officinal part: The dried leaves, imported from Peru.

*Characters of the Leaves.*—From two to eight inches long, veined and tesselated on the upper surface, downy beneath, with an aromatic, slightly astringent, warm taste, and an agreeable, aromatic odour. The leaves contain *a bitter principle* (*Maticine*), which is soluble in alcohol and in water; *an aromatic volatile oil,* which, when first deposited, is light green and transparent, but when kept becomes thick and crystalline; *a soft dark-green resin; a little tannin* and *artanthic acid.*

INFUSUM MATICÆ—Infusion of Matico.—*Take of matico, cut small, ½ ounce; boiling distilled water, 10 fluid ounces. Infuse in a covered vessel for half-an-hour, and strain.*

*Dose.*—Of powdered matico, ten to thirty or forty grains; of the infusion, one to four fluid ounces.

*Therapeutics.*—Matico acts as an aromatic bitter astringent stimulant and stomachic, and may be used internally in the same manner as the preparations of pepper and cubebs. As an internal remedy, its astringent properties are not well marked, and although it acts externally as a reliable hæmostatic, the effect is due to the mechanical action of the leaf, not to its astringency. It is given internally in affections of the bladder and rectum, for the same purposes as pepper and cubebs are given ; but its chief use is as an external application to check bleeding from small wounds, such as leech-bites, in epistaxis. The under surface of the leaf, from its reticulated texture, is said to be more efficacious as a hæmostatic than the upper.

**CUPULIFERÆ**—The Hazel and Oak Order.—Amentiferous trees or shrubs, abounding in the forests of temperate regions. Officinal plant : *Quercus pedunculata.*

**Quercus Cortex**—Oak Bark.—Officinal plant : *Quercus pedunculata ;* the British Oak. Officinal part : The dried bark of the small branches and young stems ; collected in spring from trees growing in Britain.

*Botany.*—A handsome tree. *Leaves*, on short foot-stalks, cuneately oblong, pinnatifid, slightly pubescent beneath, deciduous. *Fruit*, two or thee acorns upon a long peduncle. *Habitat*, indigenous.

*Characters of the Bark.*—Covered with a greyish-shining epidermis, cinnamon-coloured on the inner surface, fibrous, brittle, and strongly astringent. The bark contains about ten per cent. of tannic acid, and other constituents.

DECOCTUM QUERCUS—DECOCTION OF OAK BARK.—*Take of oak bark, bruised,* 1½ *ounce ; distilled water,* 1 *pint. Boil for ten minutes in a covered vessel, then strain, and pour as much distilled water over the contents of the strainer as will make the strained product measure a pint.*

*Dose*, of the decoction, one to three fluid ounces.

*Therapeutics.*—Oak bark is used for the sake of its astringency, and is suitable for internal use, as a gargle, as an injection, and as a lotion, in diarrhœa, relaxed throat, leucorrhœa, flabby ulcers, &c.

**Galla**—Galls—Nutgalls.—Officinal plant : *Quercus infectoria ;* the Gall Oak. Officinal part : Excrescences caused by the punctures and deposited ova of *Diplolepis Gallæ tinctoriæ.*

*Botany.*—A small tree or shrub, four to eight feet high, with crooked stem ; very smooth, shortly stalked, ovate oblong, deciduous leaves, and a solitary obtuse acorn, two or three times longer than the cupule. *Habitat*, Asia Minor.

*Characters.*—Hard heavy globular bodies, varying in size from half-an-inch to three-fourths of an inch in diameter, tuberculated on the surface, the tubercles and intervening spaces smooth; of a bluish-green colour on the surface; yellowish-white within, with a small central cavity, intensely astringent.

Galls, or Nutgalls, are produced by the female of the *Diplolepis Gallæ tinctoriæ,* which pierces by means of her ovipositor, the buds and tender parts of the branches and shoots of the tree, leaving her ova in the wound. The irritation produced by the foreign substance causes a flow of the juices of the plant towards the part, which soon forms an enlargement or excrescence, the gall of commerce. Within this excrescence the larva is developed, and as soon as the perfect insect is produced, it feeds upon the nucleus of the gall, and gradually eats its way out. Galls vary in size, weight, shape, and external appearance; they receive different names according to the country from which they are imported, as Levant Galls, Syrian Galls, Turkey Galls, Smyrna Galls, Aleppo Galls, &c.; but they are also named in accordance with their external appearance, as blue or green, and white galls. Blue or green galls are the best; they vary in size from that of a pea to that of a hazel nut, and are perfect—that is, they still contain the insect. White galls are larger, paler, and less valuable, and generally present a small circular aperture produced by the insect in its escape. Nutgalls are inodorous, have a powerfully astringent taste, are easily powdered, and yield their properties to water, which is the best solvent, to proof spirit, and somewhat to alcohol and to ether. Galls contain tannic, gallic, and ellagic acids, extractive, mucilage, &c.

TINCTURA GALLÆ—TINCTURE OF GALLS.—*Take of galls, in coarse powder,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the galls for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* ʒss. *to* ʒii.

UNGUENTUM GALLÆ—OINTMENT OF GALLS.—*Take of galls, in fine powder,* 80 *grains; benzoated lard,* 1 *ounce. Mix thoroughly.*

UNGUENTUM GALLÆ CUM OPIO—OINTMENT OF GALLS AND OPIUM.—*Take of ointment of galls,* 1 *ounce; opium in powder,* 32 *grains. Mix thoroughly.*

*Therapeutics.*—Galls are employed for the sake of their astringency in passive internal hæmorrhages, in chronic diarrhœa and dysentery, in profuse chronic mucous discharges, &c.; they are used as topical astringents in the form of gargle, lotion, wash, or injection; as antidotes, they are employed in poisoning by tartar emetic and the alkaloids. The ointments are employed chiefly as applications to hæmorrhoids.

**Acidum Tannicum**—Tannic Acid ($C_{27}H_{22}O_{17}$) obtained from galls.

PREPARATION.—*Take of galls, in powder, and ether, of each, a sufficient quantity. Expose the powdered galls to a damp atmosphere for two or three days, and afterwards add sufficient ether to form a soft paste. Let this stand in a well-closed vessel for twenty-four hours, then, having quickly enveloped it in a linen cloth, submit it to strong pressure in a suitable press, so as to separate the liquid portion. Reduce the pressed cake to powder, mix it with sufficient ether, to which one-sixteenth of its bulk of water has been added, to form again a soft paste, and press this as before. Mix the expressed liquids, and expose the mixture to spontaneous evaporation until, by the aid, subsequently of a little heat, it has acquired the consistence of a soft extract; then place it on earthen plates or dishes, and dry it in a hot-air chamber at a temperature not exceeding* 212°.

*Characters.*—In pale yellow vesicular masses or thin glistening scales, with a strongly astringent taste, and an acid reaction; readily soluble in water and rectified spirit, very sparingly soluble in ether. The aqueous solution precipitates solution of gelatine yellowish-white, and the persalts of iron of a bluish-black colour. It leaves no residue when burned with free access of air.

**Glycerinum Acidi Tannici**—Glycerine of Tannic Acid.

PREPARATION.—*Take of tannic acid,* 1 *ounce; glycerine,* 4 *fluid ounces. Rub them together in a mortar, then transfer the mixture to a porcelain dish, and apply a gentle heat until complete solution is effected.*

*Therapeutics.*—A useful external astringent, and forms an excellent application to chapped nipples and hands, and for relaxed and inflamed sore throat (in which case it should be painted over the throat with a camel-hair brush). It is also useful in muco-purulent discharges from the nose and the vagina. In the proportion of one part in seven of water it forms a good gargle; but it is more applicable for external employments if, instead of being made entirely with glycerine, one-half of the glycerine is replaced by water.

SUPPOSITORIA ACIDI TANNICI—TANNIN SUPPOSITORIES. —*Take of tannic acid, 36 grains; benzoated lard, 44 grains; white wax, 10 grains; oil of theobroma, 90 grains. Melt the wax and oil of theobroma with a gentle heat, then add the tannic acid and benzoated lard, previously rubbed together in a mortar, and mix all the ingredients thoroughly. Pour the mixture while it is fluid into suitable moulds of the capacity of fifteen grains; or the fluid mixture may be allowed to cool, and then be divided into twelve equal parts, each of which shall be made into a conical or other convenient form for a suppository.*

SUPPOSITORIA ACIDI TANNICI CUM SAPONE.—TANNIC ACID SUPPOSITORIES WITH SOAP.—*Take of tannic acid, 36 grains; glycerine of starch, 50 grains; curd soap, in powder, 100 grains; starch, in powder, a sufficiency. Mix the tannic acid with the glycerine of starch and soap, and add sufficient starch to form a paste of suitable consistence. Divide the mass into twelve equal parts, each of which is to be made into a conical or other convenient form for a suppository.*

TROCHISCI ACIDI TANNICI—TANNIN LOZENGES.—*Take of tannic acid, 360 grains; tincture of tolu, ½ fluid ounce; refined sugar, in powder, 25 ounces; gum acacia, in powder, 1 ounce; mucilage of gum acacia, 2 fluid ounces; distilled water, 1 fluid ounce. Dissolve the tannic acid in the water; add, first, the tincture of tolu, previously mixed with the mucilage, then the gum and the sugar, also previously well mixed. Form the whole into a proper mass; divide it into 720 lozenges, and dry these in a hot-air chamber with a moderate heat. Each lozenge contains half-a-grain of tannic acid.*

*Dose.*—Of tannic acid, two or three to ten or more grains, in pill, or powder, or dissolved in water; for a gargle, lotion, or injection, five to ten grains to an ounce of water; or it may be made into an ointment.

*Therapeutics.*—Tannic acid acts as a powerful astringent to mucous membranes; it forms compounds with the albuminous and gelatinous constituents of the membrane; it contracts the capillaries and the muscular tissue, and, as a result, it diminishes secretion, hyperæmia, and relaxation. It is employed, both internally and externally, to arrest hemorrhages and chronic discharges, and to astringe relaxed tissues. It is employed in hemorrhages from the gums, nose, lungs, stomach, bowels, uterus, kidneys; in the night sweats and diarrhœa of phthisis; in chronic bronchial catarrh; in mucous and purulent discharges from the urinary organs, &c. As a topical agent, it is used to check the bleeding of slight wounds, as an application to weak discharging ulcers, as an injection in leucorrhœa, gonorrhœa, and gleet, as an application in prolapsus ani, hæmorrhoids, fissures of the rectum, &c. Also, as an application to certain discharging skin diseases, to sore nipples, in some affections of the eye, &c. It has been used internally, also, in dyspepsia, in albuminuria, to check excessive vomiting after the use of ipecacuan, &c. But tannic acid is more to be depended upon as a topical than as a remote agent, because before it is absorbed it must first be converted into gallic acid; and as gallic acid has little or no local action, it is to be preferred as a systemic astringent, as it is more powerful in an equal dose, and does not disturb the stomach. It is converted into gallic and pyrogallic acids in the system.

**Acidum Gallicum**—Gallic Acid.—An acid ($H_3C_7H_3O_5H_2O$) prepared from galls.

PREPARATION.—*Take of galls, in coarse powder,* 1 *pound; distilled water, a sufficiency. Place the powder of galls in a porcelain dish, pour on as much of the water as will convert it into a thick paste, and keep it in this moistened condition for six weeks, at a temperature of between* 60° *and* 70°, *adding distilled water from time to time to supply what is lost by evaporation. At the end of that time, boil the paste for twenty minutes with forty-five fluid ounces of the water, strain through calico, and when the fluid has cooled, collect on a filter the crystalline deposit which has formed, and let it drain. Press it strongly between folds of filtering paper, and redissolve in ten ounces of boiling distilled water. When the fluid has cooled to* 80°, *pour it off from the crystals which have formed, wash these with three ounces of ice-cold distilled water, and dry them, first by filtering paper, and finally at a temperature not exceeding* 100°. *By boiling the undissolved portion of the galls with forty-five additional ounces of water, filtering into a dish containing the liquor decanted from the crystals in the preceding process, evaporating to the bulk of ten ounces, and cooling to* 80°, *an additional quantity of acid may be obtained, which, however, is usually a little darker in colour than the product of the previous crystallization.*

*Characters.*—Crystalline, in acicular prisms or silky needles, sometimes nearly white, but generally of a pale fawn colour, inodorous. It requires about a hundred parts of cold water for its solution, but dissolves in three parts of boiling water. Soluble also in rectified spirit. The aqueous solution gives no precipitate with solution of isinglass. It gives a bluish-black precipitate with a persalt of iron. The crystalline acid when dried at 212° loses 9·5 per cent. of its weight. It leaves no residue when burned with free access of air.

GLYCERINUM ACIDI GALLICI — Glycerine of Gallic Acid.—*Take of gallic acid, 1 ounce; glycerine, 4 fluid ounces. Rub them together in a mortar, then transfer the mixture to a porcelain dish, and apply a gentle heat until complete solution is effected.*

*Dose.*—Three to ten, fifteen, or more grains, three or four times a-day, of the glycerine, one-half to one fluid drachm; it may be given also in the form of pill or mixture; but when given with an aqueous vehicle, it requires mucilage to suspend it.

*Therapeutics.*—Gallic acid acts as a powerful systemic astringent, and may be employed in hæmoptysis, hæmaturia, menorrhagia, purpura hæmorrhagica, chronic Bright's disease, &c., as being amenable to the internal use of tannic acid, for which purposes, indeed, it is much better adapted. Gallic acid is as much superior to tannic acid as an internal and remote astringent, as tannic acid is to gallic acid as an external and topical astringent. It does not constipate the bowels, which is also frequently a matter of considerable therapeutical importance.

**CONIFERÆ or PINACEÆ**—The Coniferous or Pine Order.—Resinous trees or shrubs, inhabiting various parts of the world, both in cold and warm climates, but chiefly met with in the temperate regions of both hemispheres.

**Oleum Terebinthinæ**—Oil of Turpentine.—Officinal plants: *Pinus Palustris; Pinus Tæda;* and sometimes *Pinus Pinaster.* Officinal part: The oil, distilled from the oleo-resin (turpentine) imported from America and France.

*Characters.*—Limpid, colourless, with a strong, peculiar odour, and pungent and bitter taste.

Turpentine is obtained by tapping the pines at the lower part of the stem near the roots. It is an oleo-resin, at first liquid, but when kept for some time, it hardens, partly by the escape of the volatile oil, and partly by its resinification. The resin is dissolved in the volatile oil. By distillation, the oil is removed, leaving the resin behind. *Volatile oil of Turpentine*—commonly called *Spirits of Turpentine*—has the constitution $C_{10}H_{16}$, a specific gravity of 0·86, is scarcely soluble in water, but is soluble in ether and in alcohol. When exposed to the air, it partly volatilises, and partly resinifies, absorbing oxygen. It is highly inflammable, burning with a yellow smoky flame.

CONFECTIO TEREBINTHINÆ—Confection of Turpentine. —*Take of oil of turpentine, 1 fluid ounce; liquorice root, in powder,* *1 ounce; clarified honey, 2 ounces. Rub the oil of turpentine with the liquorice, add the honey, and mix to a uniform consistence. Dose, ℥ss. to ℥ii. or more.*

ENEMA TEREBINTHINÆ—Enema of Turpentine.—*Take of oil of turpentine, 1 fluid ounce; mucilage of starch, 15 fluid ounces. Mix.*

LINIMENTUM TEREBINTHINÆ—Liniment of Turpentine.—*Take of soft soap, 2 ounces; camphor, 1 ounce; oil of turpentine, 16 fluid ounces. Dissolve the camphor in the oil of turpentine, then add the soap, rubbing them together until they are thoroughly mixed.*

LINIMENTUM TEREBINTHINÆ ACETICUM—Liniment of Turpentine and Acetic Acid.—*Take of oil of turpentine, acetic acid, liniment of camphor, of each, 1 fluid ounce. Mix.*

UNGUENTUM TEREBINTHINÆ—Ointment of Turpentine.—*Take of oil of turpentine, 1 fluid ounce; resin, in coarse powder, 60 grains; yellow wax, prepared lard, of each, ½ ounce. Melt the ingredients together by the heat of a steam or water-bath. Remove the vessel, and stir the mixture constantly while it cools.*

**Resina**—Resin.—The residue of the distillation of the turpentines from various species of *Pinus* and *Abies*.

*Characters.*—Translucent, yellowish, brittle, pulverisable; fracture shining; odour and taste faintly terebinthinate. It is easily fusible, and burns with a dense yellow flame and much smoke. The resin of commerce varies much in its physical characters. It contains three acids; *Pinic acid, Sylvic acid,* and *Colophonic acid,* the latter of which is formed by the action of heat upon the sylvic acid.

EMPLASTRUM RESINÆ—Resin Plaster.—*Take of resin, 4 ounces; lead plaster, 2 pounds; hard soap, 2 ounces. To the lead plaster, previously melted with a gentle heat, add the resin and soap, first liquefied, and stir them until they are thoroughly mixed.*

UNGUENTUM RESINÆ—Ointment of Resin.—*Take of resin, in coarse powder, 8 ounces; yellow wax, 4 ounces; simple ointment, 16 ounces. Melt with a gentle heat, strain the mixture while hot through flannel, and stir constantly while it cools.*

*Therapeutics.*—Turpentine acts in small doses as a stimulant, diuretic, diaphoretic, astringent, and antispasmodic; in larger doses as an anthelmintic and purgative. Externally, it acts as a rubefacient and counter-irritant. It communicates a violet odour to the urine. It occasionally produces nausea, vertigo, feverish restlessness, a kind of intoxication, delirium, coma, strangury, or a cutaneous eruption, one or more of which symptoms are produced in some persons by turpentine in any form; untoward results may follow the use of turpentine even when given in medium doses, and it has proved fatal in several cases, only to produce this result the dose requires to be very large. Turpentine has been employed internally in a variety of cases, the chief object of its administration being to arouse the vital energies, to arrest passive hemorrhages and chronic mucous discharges, to act as a diuretic, or anthelmintic, &c. It is given with advantage in chronic bronchitis with copious and fœtid expectoration in abscess and gangrene of the lungs. As a hæmastatic in hæmoptysis unaccompanied by fever, in hæmaturia and purpura hæmorrhagica, in chronic cystitis and gleet, to check the secretion from the mucous membrane of the bladder and urethra, in neuralgia and frontal headaches from exhaustion, in iritis, &c. The dose for these purposes being 15 mins. to one drachm, given floating on water or made into an emulsion with mucilage as a purgative or anthelmintic, the dose is from a-half to two ounces. Externally, it is employed as a rubefacient and counter-irritant; it may be applied in the form of one of the liniments, or by dipping flannel into hot water, wringing it, sprinkling the surface with oil of turpentine, and then applying it as hot as the patient can bear it. Resin, or *Basilicon*, ointment is used as a stimulating and detergent application to indolent and offensive ulcers.

**Terebinthina Canadensis**—Canada Balsam. — Officinal plant: *Abies balsamea;* Balm of Gilead Fir. Officinal part: The turpentine, obtained from the stem by incision, in Canada.

*Characters.*—A pale-yellow ductile oleo-resin, of the consistence of thin honey, with a peculiar agreeable odour, and a slightly bitter, feebly acrid taste; by exposure drying very slowly into a transparent adhesive varnish; solidifying when mixed with a sixth of its weight of magnesia.

*Therapeutics.*—Canada Balsam, so called, is a pure oleo-resin; it may be used in many cases as a substitute for the common oil of turpentine, but its local action is not so powerful, or is it absorbed so readily. It is chiefly employed in chronic mucous discharges from the genito-urinary organs. It may be given in doses of twenty or thirty grains, either in the form of pills or emulsion.

**Thus Americana**—Common Frankincense.—Officinal plant: *Pinus Tæda*, the Frankincense Pine; and *Pinus palustris*, the

Swamp Pine. Officinal part: The concrete turpentine; from the Southern States of North America.

*Characters.*—A softish bright-yellow opaque solid, resinous but tough, having the odour of American turpentine.

*Therapeutics.*—Frankincense possesses the properties of the other solid turpentines, but is used only as an adjunct to plasters to give consistence, as in the pitch plaster, and is probably identical with ordinary resin.

**Pix Burgundica**—Burgundy Pitch.—Officinal plant: *Abies excelsa*, the Spruce Fir. Officinal part: A resinous exudation from the stem, melted and strained; imported from Switzerland.

*Characters.*—Hard and brittle, yet gradually taking the form of the vessel in which it is kept; opaque, varying in colour, but generally dull reddish-brown; of a peculiar somewhat empyreumatic perfumed odour, and aromatic taste. Without bitterness; free from vesicles; gives off no water when it is heated.

EMPLASTRUM PICIS — PITCH PLASTERS.—*Take of Burgundy pitch*, 26 *ounces; common frankincense*, 13 *ounces; resin and yellow wax, of each*, 4½ *ounces; expressed oil of nutmeg*, 1 *ounce; olive oil and water, of each*, 2 *fluid ounces. Add the oils and the water to the frankincense, Burgundy pitch, resin, and wax, previously melted together; then, constantly stirring, evaporate to a proper consistence.*

*Therapeutics.*—Pitch is used only externally, as a stimulant and somewhat irritant application to the chest in chronic pulmonary complaints; to the loins in lumbago, to local neuralgic pains, &c., in the form of pitch plaster.

**Pix Liquida**—Tar.—Officinal plants: *Pinus sylvestris*, Linn., and other Pines. Officinal part: A bituminous liquid, obtained by destructive distillation.

*Characters.*—Thick, viscid, brownish-black, of a well-known peculiar aromatic odour. Water agitated with it acquires a pale brown colour, sharp empyreumatic taste, and acid reaction. Its composition is very complex. It yields, on distillation, pyroligneous and carbolic acids and volatile oil, and the residue is pitch. It also contains oil of turpentine, creasote, and resin.

*Therapeutics.*—Internally, tar is a stimulant to the mucous membrane of the alimentary canal, bronchial tubes, and genito-urinary organs. In over-doses, or if applied externally to too large an extent of surface, it causes feverishness, vomiting, purging, and exhaustion, its poisonous effects being probably due to the absorption of carbolic acid or creasote. Remedies diluents and lime water. Tar is rarely employed internally, although it was formally used in the treatment of phthisis, chronic bronchitis and cystitis. Externally, it is used as a topical stimulant application to chronic skin diseases.

UNGUENTUM PICIS LIQUIDÆ—OINTMENT OF TAR.—*Take of tar,* 5 *ounces ; yellow wax,* 2 *ounces. Melt the wax with a gentle heat, add the tar, and stir the mixture briskly while it cools.*

*Therapeutics.*—This is tar ointment according to the formula in the Edinburgh Pharmacopœia. It is useful in psoriasis, the cure being effected in a period varying from a month to six weeks. The objection to its use is its filthiness and disagreeable smell, and that the patient, when under treatment, requires to keep his room. It is also recommended in other skin diseases, as in ringworm of the scalp. Mixed with an equal bulk of citrine ointment, it is found very beneficial in prurigo senilis, in some cases it is too irritating, and should be mixed with equal parts of lard or vaseline.

**Larix Europæa**—The Common Larch.—Officinal part: *Laricis Cortex*—Larch bark ; the bark, deprived of its outer layer, of *Larix Europæa ;* the Common Larch.

*Botany.*—A tree, fifty feet high or more. *Leaves,* fascicled, deciduous. *Flowers,* monœcious ; bracts, panduriform ; males : catkins solitary, not racemose ; scales, staminiferous at the apex ; stamens, two ; anthers, one-celled ; females : catkins simple ; ovules, two at the base of the scales ; cones, ovate-oblong, lateral ; scales imbricated, with reflexed lacerated margins. *Habitat,* northern parts of Europe.

*Characters.*—Larch bark is found in quills, or more generally in flattish pieces. It consists of the inner bark, middle bark, and a variable proportion of the outer bark. The pieces vary in length and thickness, and have scarcely any taste or odour. Its outer surface has a dark-red colour and uneven appearance, caused by the irregular removal of the outer rough portion ; the inner surface is smooth, yellowish-white in colour in the larger pieces, and red in the smaller quills. It breaks with a close fracture, and the fractured surface has a deep carmine colour.

TINCTURA LARICIS—TINCTURE OF LARCH.—*Take of larch bark, in coarse powder,* 2½ *ounces ; rectified spirit,* 1 *pint. Macerate the larch bark for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally ; then transfer to a percolator, and when the fluid ceases to pass continue the percolation with the* *remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint.*

*Dose.*—Twenty to thirty minims.

*Therapeutics.*—Larch bark acts as a stimulating astringent to mucous surfaces generally, and has been found useful in arresting epistaxis and intestinal hemorrhage in typhus fever; also in cases of bronchitis, with profuse expectoration setting in during convalescence from fever, it has proved advantageous, it is less powerful than oil of turpentine, but is pleasanter to take.

**Oleum Juniperi**—Oil of Juniper.—Officinal plant: *Juniperus communis*, Common Juniper. Officinal part: The oil, distilled in Britain from the unripe fruit.

*Botany.*—A bushy shrub. *Leaves*, evergreen, numerous, three in each whorl, linear-subulate, kneeled. *Flowers*, diœcious, axillary, sessile. *Fruit*, a purplish-black berry, which ripens in the autumn of the second year. *Habitat*, northern parts of Europe, Asia, and America.

*Characters of the Oil.*—Colourless or pale greenish-yellow, of a sweetish odour, and warm aromatic taste.

The oil is obtained from the fruit by distillation with water; it is isomeric with oil of turpentine, $C_{10}H_{16}$; specific gravity, 0·8.

SPIRITUS JUNIPERI—*Take of oil of juniper*, 1 *fluid ounce; rectified spirit*, 49 *fluid ounces. Dissolve. Dose*, ʒss. *to* ʒi.

*Therapeutics.*—Juniper acts as a stimulating diuretic, and the spirit is usually employed as an adjunct to mixtures of that class, and the oil may be given in doses of 2 to 6 minims in pill, or along with other diuretics in dropsy from cardiac or hepatic disease, in renal dropsy it must be employed with caution, and not in acute cases. Hollands gin owes its flavour and diuretic qualities to oil of juniper.

**Sabina**—Savin.—Officinal plant: *Juniperus Sabina*, Common Savin. Officinal parts:—1. *Sabinæ Cacumina*, Savin Tops; the fresh and dried tops; collected in spring, from plants cultivated in Britain. 2. *Oleum Sabinæ*, Oil of Savin; the oil, distilled in Britain from fresh savin.

*Botany.*—A small bushy shrub. *Leaves*, small, ovate, densely imbricated, opposite, glandular. *Fruit*, round, bluish-purple, about the size of a currant. *Habitat*, middle and south of Europe, Russia in Asia.

*Characters of the Tops.*—Twigs densely covered with minute imbricated appressed leaves in four rows; odour, strong, peculiar, and unpleasant; taste, acrid, bitter, resinous, and disagreeable.

*Characters of the Oil.*—Colourless or pale yellow. *Dose*, 2 to 6 mins.

The medicinal properties of the plant are due to its volatile oil, which is obtained from the fresh tops by distillation with water. The oil has the unpleasant odour of the plant, and a bitter acrid taste; it is limpid, and is isomeric with oil of turpentine, $C_{10}H_{16}$.

TINCTURA SABINÆ—TINCTURE OF SAVIN.—*Take of savin tops, dried and coarsely powdered, 2½ ounces; proof spirit, 1 pint. Macerate the savin for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose, 20 mins. to ʒi.*

UNGUENTUM SABINÆ—OINTMENT OF SAVIN.—Ceratum Sabinæ, *Edin.—Take of fresh savin tops, bruised,* 8 *ounces; yellow wax,* 3 *ounces; prepared lard,* 16 *ounces. Melt the lard and the wax together on a water-bath, add the savin, and digest for twenty minutes; then remove the mixture, and express through calico.*

*Therapeutics.*—Savin in over-doses acts as a powerful local irritant, causing vomiting, purging, and severe pain in the stomach and intestines, with inflammation of the parts. Externally, the oil acts as a rubefacient and vesicant. In poisoning by savin, the indications are to allay pain by opiates, inflammatory action by antiphlogistics, and to soothe the parts by demulcents. Savin is occasionally used with the criminal intention of procuring abortion—a practice which is scarcely less dangerous than immoral, and may occasion the death of the mother by producing severe inflammation. Medicinally, it is not much given internally, but may be employed as a so-called emmenagogue in amenorrhœa and chlorosis; but as it acts by stimulating the uterus, it is contra-indicated in irritable and inflammatory states of that organ or of the adjoining viscera. The ointment acts as a topical irritant, and is chiefly used as an application to setons and blisters, for the purpose of maintaining a perpetual sore. Equal parts of savin and verdigris in powder, or of savin and alum in powder, are used as applications to venereal warts.

## CLASS II.—MONOCOTYLEDONES, ENDOGENÆ, OR AMPHIBRYA.

### SUB-CLASS I.—DICTYOGENÆ.

**SMILACEÆ**—The Sarsaparilla Order.—Herbs or shrubby plants, often climbing, natives of temperate and tropical regions. The plants possess demulcent, diuretic, and alterative properties. Officinal plant: *Smilax officinalis.*

**Sarsæ Radix**—Jamaica Sarsaparilla.—Officinal plant: *Smilax officinalis.* Officinal part: The dried root; native of Central America; imported from Jamaica.

*Characters.*—Roots not thicker than a goose-quill, generally many feet in length, reddish-brown, covered with rootlets, and folded in bundles about eighteen inches long, scentless; taste mucilaginous, feebly bitter, faintly acrid.

Commercial Sarsaparilla consists of the fibrous root of the plant, often bearing a portion also of the root-stock, or subterranean tuberous stem, called by druggists the "chump." The rhizome is a solid mass, presenting no distinct division into bark, wood, and pith. The true root-fibres are many feet in length, and usually about the thickness of a quill. They receive a variety of names, according to their condition: when old, dry and withered, they are called *lean;* when plump and fully swelled out, they are called *gouty;* when they are well filled with starch, they are called *mealy;* when the fibres give off numerous little fibrillæ, they are said to be *bearded.* The root is almost inodorous, but has a mucilaginous and somewhat acrid taste. It is of a reddish-brown colour externally, and is divisible into an outer bark or cortex, and an inner meditullium surrounding the pith. The roots are commonly imported in bundles, twisted or rolled into different shapes; sometimes they have portions of the rhizome or chump adherent. The sarsaparilla of commerce is distinguished by the names of countries by which it is furnished; thus it is known as Mexican, Guatemala, Honduras, Costa Rica, Lima, Columbian, Brazilian, Peruvian, Caraccas, Vera Cruz, Jamaica. These different kinds are recognised chiefly by slight differences in their external appearances, especially by the manner in which the bundles are constructed. The Jamaica variety is one of the most esteemed, and bears the officinal characters. Sarsaparilla contains, besides other ingredients, a peculiar crystallizable neutral principle, which has received at different times the names of *paraglin, salseparin,* *parallinic acid*, and *smilacin*. It is more commonly known by the latter name. It is white, crystallizable, has a bitter taste, is partially soluble in cold, and more so in boiling water, and also in hot spirit, in ether, and in oils. Sarsaparilla also contains a volatile oil, which has the acrid taste of the root, but is almost entirely lost in the drying; it also contains an acrid bitter resin, mucilage, lignin, &c. It yields its active ingredients to hot and cold water, and to dilute spirit. Its activity is impaired by long boiling.

DECOCTUM SARSÆ—DECOCTION OF SARSAPARILLA.—*Take of Jamaica sarsaparilla, cut transversely, 2½ ounces; boiling distilled water, 1½ pint. Digest the sarsaparilla in the water for an hour, then boil for ten minutes in a covered vessel, cool, and strain, pouring distilled water, if required, over the contents of the strainer, or otherwise making the strained product measure a pint. Dose,* ℥iv. *to* ℥viii.

DECOCTUM SARSÆ COMPOSITUM—COMPOUND DECOCTION OF SARSAPARILLA.—*Take of Jamaica sarsaparilla, cut transversely, 2½ ounces; sassafras root, in chips, guaiacum wood turnings, and fresh liquorice root, bruised, of each, ¼ ounce; mezereon bark, 60 grains; boiling distilled water, 1½ pint. Digest the solid ingredients in the water for an hour, then boil for ten minutes in a covered vessel, cool, and strain, pouring distilled water, if required, over the contents of the strainer, or otherwise making the strained product measure a pint. Dose,* ℥iii. *to* ℥vi.

EXTRACTUM SARSÆ LIQUIDUM—LIQUID EXTRACT OF SARSAPARILLA.—*Take of Jamaica sarsaparilla, cut transversely, 1 pound; distilled water, at 160°, 14 pints; rectified spirit, 1 fluid ounce. Digest the sarsaparilla in one-half of the water for six hours, and decant the liquor. Digest the residue in the remainder of the water for the same time, express and filter the mixed liquors, and evaporate them by a water-bath to seven fluid ounces, or until the specific gravity of the liquid is 1·13. When cold, add the spirit. The specific gravity should be about 1·095. Dose,* ʒss. *to* ℥ss.

*Therapeutics.*—There has been, as yet, but little explanation given of the physiological action of sarsaparilla; it is said to act as an alterative, diaphoretic, and tonic. In over-doses the powdered root and smilacin have produced nausea, vomiting, and derangement of the digestive organs. The kinds which contain a good deal of starch act as demulcents. Perhaps there is no drug about whose medicinal value so great a diversity of opinion exists as sarsaparilla. There are those in the profession who esteem it highly, and there are others who value it no more than straw; nevertheless, it is extensively employed, and it has been said that, as a rule, surgeons esteem it more than physicians. But from the experiments of Böcker of Bonn, it appears that paraglin has no influence on the system, nor does sarsaparilla appear to have any more influence, as the only sensible effects which follow even the largest draughts of the simple decoction are merely the result of slight gastric disturbance. But it is frequently given in combination with powerful remedies—as iodide of potassium, mineral acids, or mercurial preparations, or in the form of the compound decoction, which, in addition to sarsaparilla, contains guaiacum, sassafras, and mezereon, all of which are stimulants and diaphoretics ; and to these other substances must be attributed any beneficial effect which follows the administration of the compound decoction, and not to the sarsaparilla itself. It is chiefly employed in the treatment of inveterate venereal diseases, especially in those cases in which the patient's constitution is broken down, and the characteristic cachexia is well marked, and in which a too liberal use of mercury has added to the unhappy state of the patient. Its influence seems to be exercised rather upon the general cachectic condition of the patient, restoring his appetite and increasing his weight, rather than as a specific upon the disease itself. In combination with other suitable remedies, sarsaparilla is given in chronic rheumatism, in obstinate chronic cutaneous affections, and in the generally disordered state of the system distinguished by the generic name cachexia.

## SUB-CLASS II.—PETALOIDEÆ, OR FLORIDÆ.

**ZINGIBERACEÆ**—The Ginger Order.—Herbs, nearly all tropical, abounding in the East Indies. The plants possess aromatic and stimulant properties. Officinal plants : *Zingiber officinale*, *Elettaria cardamomum*, and *Carcuma Longa.*

**Zingiber**—Ginger.—Officinal plant : *Zingiber officinale.* Officinal part : The rhizome, scraped and dried ; from plants cultivated in the West Indies, India, and other countries.

*Characters.* — Irregular, lobed, decorticated pieces, three or four inches long, subcompressed, yellowish-white, but not chalky on the surface, with a short mealy fracture, hot taste, and agreeable aroma. Powder, yellowish-white.

The more important ingredients of ginger are volatile oil, resin, and starch. The volatile oil upon which its properties chiefly depend, is pale yellow and light, and has the odour and the acrid burning taste of ginger.

SYRUPUS ZINGIBERIS—Syrup of Ginger.—*Take of strong tincture of ginger, 6 fluid drachms; syrup, 19 fluid ounces. Mix, with agitation. Dose,* ʒi. *to* ʒii.

TINCTURA ZINGIBERIS—Tincture of Ginger.—*Take of ginger, in coarse powder,* 2½ *ounces; rectified spirit,* 1 *pint. Macerate the ginger for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose,* ʒss. *to* ʒi.

TINCTURA ZINGIBERIS FORTIOR—Strong Tincture of Ginger—Essence of Ginger.—*Take of ginger, in fine powder,* 10 *ounces; rectified spirit, a sufficiency. Pack the ginger tightly in a percolator, and pour over it carefully half-a-pint of the spirit. At the expiration of two hours add more spirit, and let it percolate slowly until one pint of the tincture has been collected. Dose,* 5 *to* 20 *mins.*

*Dose.*—Of powdered ginger, five to twenty or thirty grains.

*Therapeutics.*—Ginger acts as an aromatic stimulant, carminative, and stomachic, and is chiefly used as a corrective adjunct to obviate the nausea and griping of certain purgatives, and as a stimulant in atonic dyspepsia with flatulence. It is also occasionally used as a masticatory. Externally, it acts as an irritant and rubefacient.

**Cardamomum** — Cardamoms. — Officinal plant: *Elettaria Cardamomum*; the Malabar Cardamom. Officinal parts: The seeds contained in their capsules, which are to be removed when the seeds are employed; cultivated in Malabar.

*Characters.*—Seeds obtusely angular, corrugated, reddish-brown, internally white, with a warm, aromatic, agreeable taste and odour, contained in ovate oblong, triangular, pale-brown, coriaceous, ribbed pericarps.

Malabar cardamoms are the dried fruit of the plant, and are gathered in November. Several varieties are recognised in commerce, and are distinguished by the designations *shorts*, *short-longs*, and *long-longs*. The seeds are contained in the capsules; they have a warm, pungent taste, and a peculiar aromatic odour, depending upon a volatile oil.

TINCTURA CARDAMOMI COMPOSITA—COMPOUND TINCTURE OF CARDAMOMS.—*Take of cardamom seeds, freed from the pericarps and bruised,* ¼ *ounce; caraway fruit, bruised,* ¼ *ounce; raisins, freed from their seeds,* 2 *ounces; cinnamon bark, bruised,* ½ *ounce; cochineal, in powder,* 60 *grains; proof spirit,* 1 *pint. Macerate the solid ingredients for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.*

*Dose.*—Of the compound tincture, thirty minims to two fluid drachms.

*Therapeutics.*—Cardamoms act as an aromatic stimulant, and are used as a stomachic or corrective adjunct to other medicines.

**Turmeric**—The rhizome of *Curcuma longa*, Ceylon.—Turmeric is placed in the Appendix of the Pharmacopœia as a test. Turmeric is met with in various forms, but chiefly in what are termed *round* and *long* pieces; the long pieces are more common, they are about the size of the little finger. Turmeric affords a bright yellow powder, has a warm, bitterish taste, and a peculiar odour. Its warm, stimulating properties depend upon an acrid, odorous, volatile oil. Turmeric is a usual ingredient of curry powder, and is otherwise used as a condiment, but it is officinal only as a test for alkalies, which change its yellow colour to reddish-brown.

TURMERIC PAPER.—*Unsized paper steeped in tincture of turmeric, and dried by exposure to the air.*

TURMERIC TINCTURE.—*Take of turmeric, bruised,* 1 *ounce; proof spirit,* 6 *fluid ounces. Macerate for seven days and filter.*

**IRIDACEÆ**—The Iris Order.—Herbs inhabiting temperate and warm parts of the world. The plants possess acrid, purgative, and emetic properties. Officinal plant: *Crocus sativus.*

**Crocus**—Saffron.—Officinal plant: *Crocus sativus*; the Saffron Crocus. Officinal part: The stigma and part of the style, dried; imported from Spain, France, and Naples.

*Characters.*—Thread-like styles, each terminated by three long orange-brown stigmas, broadest at the summit. Has a powerful aromatic odour. Rubbed on the wet finger, it leaves an intense orange yellow tint.

The flowers are gathered early in the morning, before they are expanded, the stigmata with part of the styles are torn out, spread upon paper, and dried, the rest of the flower being rejected. Cake Saffron is formed by pressing the too-ripe or injured stigmata. Saffron, or Hay Saffron, occurs in loose masses. It has a warm, bitterish taste, and an aromatic odour; it imparts a deep yellow colour to water and to spirit, and to the saliva when chewed.

TINCTURA CROCI—TINCTURE OF SAFFRON.—*Take of saffron, 1 ounce; proof spirit, 1 pint. Macerate the saffron for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint.*

*Dose.*—Of the tincture, one or two fluid drachms.

*Therapeutics.*—Saffron is seldom prescribed in this country, except as a colouring agent; it has been used as an emmenagogue and anodyne in painful menstruation.

**LILIACEÆ**—The Lily order.—Herbs, shrubs, or trees, natives both of temperate and tropical regions. The plants possess purgative, emetic, stimulant, diaphoretic, astringent, and other properties. Officinal plants: *Aloe Vulgaris* and other species, *Urginea Scilla.*

**Aloe Barbadensis**—Barbadoes Aloes.—Officinal plant: *Aloe Vulgaris*, the Yellow Flowering Aloe. Officinal part: The juice of the leaf inspissated; imported from Barbadoes.

**Aloe Socotrina**—Socotrine Aloes.—Officinal plants: one or more undetermined species of aloe. Officinal part: The juice of the leaf inspissated; usually procured from Socotra, and shipped to Europe by way of Bombay.

*Characters of Barbadoes Aloes.*—In yellowish-brown or dark-brown opaque masses; breaks with a dull conchoidal fracture; has a bitter nauseous taste, and a strong disagreeable odour; dissolves almost entirely in proof spirit, and during solution exhibits under the microscope numerous crystals. Usually imported in gourds.

*Characters of Socotrine Aloes.*—In reddish-brown masses, opaque or translucent at the edges; breaks with an irregular or smooth and resinous fracture; has a bitter taste, and a strong but fragrant odour; dissolves entirely in proof spirit, and during solution exhibits under the microscope numerous minute crystals.

Several varieties of aloes are distinguished in commerce, such as Barbadoes, Socotrine, Hepatic, Indian, Cape, &c.; but only the two former are officinal. They consist of the inspissated juice of the leaves. The true aloe juice lies immediately within the epidermis, and not in the interior of the leaves, and it readily runs out when the leaves are cut near the base, and placed in an upright position with the cut surface downwards. The juice thus collected is evaporated either by exposure to the sun or by the aid of artificial heat. The more important constituents of aloes are, volatile oil, *Aloin*, *Aloe resin*, and *Aloetic acid*. *Aloin* constitutes from twenty to twenty-five per cent. of the better kind of aloes. It has been largely prepared by Messrs. T. & H. Smith of this city. It occurs in acicular crystals, and has the constitution $C_{17}H_{18}O_7$; it is inodorous, and has at first a sweetish taste, which afterwards becomes intensely bitter; it is soluble in warm ether, but very slightly so in cold water or alcohol. It appears to exist in a crystalline and amorphous condition, the latter being the result of its preparation by heat; both are active. *Aloe resin* is of a brown colour, transparent, soluble in alcohol, in ether, in alkaline solutions, and is inoperative.

DECOCTUM ALOES COMPOSITUM—Compound Decoction of Aloes.—*Take of extract of Socotrine aloes,* 120 *grains; myrrh, saffron, of each,* 90 *grains; carbonate of potash,* 60 *grains; extract of liquorice,* 1 *ounce; compound tincture of cardamoms,* 8 *fluid ounces; distilled water, a sufficiency. Reduce the extract of aloes and myrrh to coarse powder, and put them, together with the carbonate of potash and extract of liquorice, into a suitable covered vessel, with a pint of distilled water; boil gently for five minutes, then add the saffron. Let the vessel with its contents cool, then add the tincture of cardamoms, and, covering the vessel closely, allow the ingredients to macerate for two hours; finally, strain through flannel, pouring as much distilled water over the contents of the strainer as will make the strained product measure thirty fluid ounces. Dose,* ℥ss. *to* ℥ii.

ENEMA ALOES—Enema of Aloes.—*Take of aloes,* 40 *grains; carbonate of potash,* 15 *grains; mucilage of starch,* 10 *fluid ounces. Mix, and rub together.*

EXTRACTUM ALOES BARBADENSIS—Extract of Barbadoes Aloes.—*Take of Barbadoes aloes, in small fragments,* 1 *pound; boiling distilled water,* 1 *gallon. Add the aloes to the water, and stir well, until they are thoroughly mixed. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed* *liquors by a water-bath or a current of warm air to dryness. Dose, 2 to 6 grains.*

EXTRACTUM ALOES SOCOTRINÆ—Extract of Socotrine Aloes.—*Take of Socotrine aloes, in small fragments,* 1 *pound; boiling distilled water,* 1 *gallon. Add the aloes to the water, and stir well until they are thoroughly mixed. Set aside for twelve hours; then pour off the clear liquor, strain the remainder, and evaporate the mixed liquors by a water-bath or a current of warm air to dryness. Dose,* 2 *to* 6 *grains.*

PILULA ALOES BARBADENSIS — Pill of Barbadoes Aloes.—*Take of Barbadoes aloes, in powder,* 2 *ounces; hard soap, in powder,* 1 *ounce; oil of caraway,* 1 *fluid drachm; confection of roses,* 1 *ounce. Beat all together until thoroughly mixed. Dose,* 5 *to* 10 *grains.*

PILULA ALOES SOCOTRINÆ—Pill of Socotrine Aloes.—*Take of Socotrine aloes, in powder,* 2 *ounces; hard soap, in powder,* 1 *ounce; volatile oil of nutmeg,* 1 *fluid drachm; confection of roses,* 1 *ounce. Beat all together until thoroughly mixed. Dose,* 5 *to* 10 *grains.*

PILULA ALOES ET ASSAFŒTIDÆ—Pill of Aloes and Assafœtida.—*Take of Socotrine aloes, in powder, assafœtida, hard soap, in powder, confection of roses, of each,* 1 *ounce. Beat all together until thoroughly mixed. Dose,* 5 *to* 20 *grains.*

PILULA ALOES ET MYRRHÆ—Pill of Aloes and Myrrh.—*Take of Socotrine aloes,* 2 *ounces; myrrh,* 1 *ounce; saffron, dried,* ½ *ounce; confection of roses,* 2½ *ounces. Triturate the aloes, myrrh, and saffron together, and sift; then add the confection of roses, and beat them together into a uniform mass. Dose,* 5 *to* 15 *grains.*

TINCTURA ALOES—Tincture of Aloes.—*Take of Socotrine aloes, in coarse powder,* ½ *ounce; extract of liquorice,* 1½ *ounce; proof spirit, a sufficiency. Macerate the aloes and extract of liquorice in fifteen fluid ounces of the spirit for seven days in a closed vessel, with occasional agitation; then filter, and add sufficient proof spirit to make one pint. Dose,* ʒi. *to* ʒiii.

VINUM ALOES—Wine of Aloes.—*Take of Socotrine aloes,* 1½ *ounce; cardamom seeds, freed from the pericarps and bruised, ginger, in coarse powder, of each,* 80 *grains; sherry, two pints. Macerate for seven days in a closed vessel, with occasional agitation; filter the liquor, and add sufficient sherry to make two pints. Dose,* ʒi. *to* ʒiii.

*Dose.*—Of Barbadoes or Socotrine aloes, one to six grains, in pill; of aloin, half-a-grain to two grains.

*Therapeutics.*—Aloes act in small doses as tonics and stomachics, and in larger doses as warm stimulant and tonic cathartics. As purgatives they are slow of action, and affect chiefly the large intestines. In some persons they produce severe irritation of the mucous membrane of the rectum, and tenesmus, in which cases they should be combined with hyoscyamus. Aloes may be given as purgatives in torpid states of the bowels, especially when the liver also is in a sluggish condition. Being slow in their action, they are not available when a prompt evacuation of the bowels is demanded. In habitual constipation, in cases in which the large intestines are apt to become loaded and inactive, in sluggish conditions of the uterine system, in amenorrhœa, &c., an aloetic purge may be given occasionally. It may be combined with advantage with ipecacuanha, 1 gr., and Ex. Belladonnæ and Nucis Vomicæ, each ¼ gr. Aloes should not be given in inflammatory states of the liver and intestines, nor in acute affections of the rectum or uterine organs, nor in certain hemorrhoidal cases, and they should be employed cautiously during pregnancy. The compound decoction acts as a tonic, antacid, emmenagogue, and mild cathartic; it is a valuable medicine in amenorrhœa and anemia, and may be combined with chalybeates. The enema acts as a stimulating purgative, and is also employed to remove ascarides.

**Scilla**—Squill.—Officinal plant: *Urginea Scilla;* Squill. Officinal part: The bulb, from the Mediterranean coasts; sliced and dried.

*Characters.*—Bulb pear-shaped, weighing from half-a-pound to ten pounds; outer scales membraneous, brownish-red or white; inner scales thick, whitish, fleshy, juicy; taste mucilaginous, intensely and disagreeably bitter, somewhat acrid. The dried slices are white or yellowish-white, slightly translucent, scentless, disagreeably bitter, brittle and easily pulverisable if very dry, but if exposed, readily recovering moisture and flexibility. Squill contains in addition to mucilage, &c., an acrid resin, and a bitter principle, scillitin, but what parts they respectively play in its medicinal action is undecided.

ACETUM SCILLÆ—Vinegar of Squill.—*Take of squill, bruised, 2½ ounces; diluted acetic acid, 1 pint; proof spirit, 1½ fluid ounces. Macerate the squill in the acetic acid for seven days, then strain with expression; add the spirit to the strained liquor, and filter. Dose, 10 to 40 mins.*

OXYMEL SCILLÆ—Oxymel of Squill.—*Take of vinegar of squill, 1 pint; clarified honey, 2 pounds. Mix and evaporate by a* *water-bath until the product, when cold, shall have a specific gravity of* 1·32. *Dose,* ʒss. *to* ʒii.

PILULA SCILLÆ COMPOSITA—COMPOUND SQUILL PILL.—*Take of squill, in powder,* 1¼ *ounce; ginger, in powder, ammoniacum, in powder, hard soap, in powder, of each,* 1 *ounce; treacle, by weight,* 2 *ounces, or a sufficiency. Mix the powders, add the treacle, and beat into a uniform mass. Dose,* 5 *to* 10 *grains.*

SYRUPUS SCILLÆ—SYRUP OF SQUILL.—*Take of vinegar of squill,* 1 *pint; refined sugar,* 2½ *pounds. Dissolve with the aid of heat. Dose,* ʒss. *to* ʒii.

TINCTURA SCILLÆ—TINCTURE OF SQUILL.—*Take of squill, bruised,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the squill for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 10 *to* 30 *mins.*

*Dose.*—Of powdered squill, as an expectorant or diuretic, one to two or three grains; in doses of from six to ten or fifteen grains powdered squill acts, though uncertainly, as an emetic.

*Therapeutics.*—Squill acts in over-doses as a narcotico-acrid poison, producing vomiting, purging, severe griping, strangury, and inflammation of the stomach and bowels; twenty-four grains of the powder have caused death. In full doses, squill acts as an emetic, but is uncertain in its operation. In small medicinal doses it acts as a diuretic and expectorant, stimulating the kidneys and broncho-pulmonary mucous membrane; it acts more or less also upon the gastro-intestinal mucous membrane, occasionally operating as a laxative. As a diuretic it is useful in dropsies, more especially if resulting from cardiac disease, and for that purpose it is usually given until it produces nausea; as an expectorant it is useful in chronic bronchial pulmonary complaints. In consequence of its irritant qualities, it is contra-indicated in acute inflammatory diseases. As an emetic it is very uncertain in its action, and is rarely given as such, except perhaps occasionally, in the form of the syrup, to children with hooping-cough. As a diuretic in heart disease, its activity is greatly promoted by combination with digitalis.

**MELANTHACEÆ**—The Colchicum Order.—Herbs, generally distributed over the world, but most abundant in northern countries. Officinal plant: *Colchicum autumnale, Asagræa officinalis, Veratrum Viride.*

**Colchicum**—Colchicum.—Officinal plant: *Colchicum autumnale*, Meadow Saffron. Officinal parts:—1. *Colchici Cormus;* the fresh corm, indigenous; collected about the end of June; and the same stripped of its coats, sliced transversely, and dried at a temperature not exceeding 150°.

*Botany.—Root*, fibrous. *Corm*, ovate, fleshy, covered with a loose brown tegument. *Leaves*, flat, broadly lanceolate, erect, about twelve inches long, dark green, smooth, appear in spring. *Flowers*, several, lilac or pale purple, arising from the young corm, in autumn, by a long, narrow, white tube. *Capsule*, three-celled. *Seeds*, numerous, small spherical, with a rough brown testa. *Habitat*, moist meadows in this and other European countries.

*Characters of the Corm.*—Fresh corm about the size of a chestnut, flattened, where it has an undeveloped bud; furnished with an outer brown and an inner yellow coat; internally white, solid and fleshy; yielding when cut a milky acrid and bitter juice. Dried slices about a line thick, moderately indented on one side, rarely on both sides, firm, flat, whitish, amylaceous.

*Characters of the Seeds.*—About the size of white mustard seed, very hard, and of a reddish-brown colour.

Both the corms and the seeds yield their active properties to water, alcohol, diluted spirit, vinegar, and wine. The more important constituents are colchicia, in combination with gallic acid, fatty matter, a volatile acid, starch, gum, &c. Colchicia closely resembles veratria, but may be distinguished from it by being soluble in water, by not possessing the acridity of veratria, and by not acting as a sternutatory.

EXTRACTUM COLCHICI—EXTRACT OF COLCHICUM.—*Take of fresh colchicum corms, deprived of their coats,* 7 *pounds. Crush the corms; press out the juice; allow the feculence to subside, and heat the clear liquor to* 212°*; then strain through flannel, and evaporate by a water-bath, at a temperature not exceeding* 160°, *until the extract is of a suitable consistence for forming pills. Dose,* ½ *to* 3 *grs.*

EXTRACTUM COLCHICI ACETICUM—ACETIC EXTRACT OF COLCHICUM.—*Take of fresh colchicum corms, deprived of their coats,* 7 *pounds; acetic acid,* 6 *fluid ounces. Crush the corms, add the acetic acid, and press out the juice; allow the feculence to subside, and heat the clear liquid to* 212°*; then strain through flannel, and evaporate by* *a water-bath, at a temperature not exceeding* 160°, *to the consistency of a soft extract. Dose,* ½ *to* 3 *grs.*

TINCTURA COLCHICI SEMINIS—Tincture of Colchicum Seed.—*Take of colchicum seed, bruised,* 2½ *ounces; proof spirit,* 1 *pint. Macerate the colchicum for forty-eight hours in fifteen ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose,* 10 *to* 30 *mins.*

VINUM COLCHICI—Wine of Colchicum.—*Take of colchicum corm, sliced, dried, and bruised,* 4 *ounces; sherry,* 1 *pint. Marcerate the colchicum in the wine for seven days in a closed vessel, with occasional agitation, press and strain through calico; then add sufficient sherry to make one pint. . Dose,* 10 *to* 30 *mins.*

*Therapeutics.*—Colchicum acts in over-doses as a powerful narcotico-acrid poison, causing severe vomiting and purging, burning pain in the throat, severe colicky pains in the bowels, tenesmus, great debility, a small, weak, frequent or fluttering pulse, cold extremities, suppression of urine, &c. Sometimes the nervous system is more affected, and there is headache, delirium, and insensibility. It is necessary to administer the preparations of colchicum with great caution, beginning with small doses, and gradually increasing them according to circumstances, not only because different samples of the drug vary in activity, but also because some constitutions are violently affected by comparatively small doses. A dose of two and a-half drachms of the tincture has proved fatal. In poisoning by colchicum, the indications are to give diluents to facilitate the removal of the poison by the vomiting and purging which it causes, to allay irritation by opiates internally and counter-irritants externally. In medicinal doses, colchicum may produce nauseant, depressant, diaphoretic, diuretic, cathartic, sedative, or anodyne effects. In small doses frequently repeated it stimulates the secreting organs; the mucous membrane of the intestines, the liver, the kidneys, and the skin being more or less affected by it. In full doses it causes nausea, vomiting, and purging, and acts as an arterial sedative; hypercatharsis, severe bilious vomiting, and salivation have followed such doses. By some, colchicum is believed to increase the quantity of uric acid in the urine; but Dr. Garrod has shown that it has no marked effect on it. Colchicum is chiefly employed in the treatment of gout, and was believed to be the active ingredient of a celebrated nostrum termed

*Eau Médicinale*, the property of a French military officer named Husson. Colchicum is generally regarded as a specific for gout; it frequently allays the pain and shortens an attack; but it is not infallible, and in many cases fails to afford any great measure of relief; and at best, it is only a palliative, not a curative remedy. It is said, also, that its use tends to encourage the frequency of the seizures, while its influence over them is gradually diminished, but clinical experience does not bear this out. The manifestation of its physiological action is probably not essential to its therapeutical effects. In rheumatism, colchicum is much less efficacious than in gout, and in acute cases it should be given with great caution. Colchicum has also been employed as a diuretic in dropsies, and as an antiphlogistic in acute inflammatory and febrile diseases; it has also been employed in jaundice, in chronic bronchial complaints, in obstinate constipation, in certain skin diseases, especially when these affections occur in an individual with a gouty tendency.

**Sabadilla**—Cevadilla.—Officinal plant: *Asagræa officinalis.* Officinal part: The dried fruit, imported from Vera Cruz and Mexico.

*Characters.*—Fruit about half-an-inch long, consisting of three light-brown papyraceous follicles, each containing from one to three seeds, which are about a quarter of an inch long, blackish-brown, shining, slightly-winged, possessing an intensely acrid bitter taste.

The seeds as met with in commerce have usually the fruit stalk and the remains of the withered calyx adherent; they are inodorous, but the powder acts as a powerful sternutatory. The seeds consist chiefly of veratria in combination with gallic acid, cevadic acid, fatty matter, wax, two kinds of resin, and probably another peculiar principle termed Sabadillina.

**Veratria**—Veratria.—An alkaloid ($C_{32}H_{52}N_2O_8$) obtained from cevadilla; not quite pure.

PREPARATION.—*Take of cevadilla, 2 pounds; distilled water, rectified spirit, solution of ammonia, hydrochloric acid, of each, a sufficiency; purified animal charcoal, 60 grains. Marcerate the cevadilla with half its weight of boiling distilled water in a covered vessel for twenty-four hours. Remove the cevadilla, squeeze it, and dry it thoroughly with a gentle heat. Beat it now in a mortar, and separate the seeds from the capsules by brisk agitation in a deep narrow vessel, or by winnowing it gently on a table with a sheet of paper. Grind the seeds in a coffee-mill, and form them into a thick paste with rectified spirit.*

*Pack this firmly in a percolator, and pass rectified spirit through it till the spirit ceases to be coloured. Concentrate the spirituous solution by distillation, so long as no deposit forms, and pour the residue, while hot, into twelve times its volume of cold distilled water. Filter through calico, and wash the residue on the filter with distilled water till the fluid ceases to precipitate with ammonia. To the united filtered liquids add the ammonia in slight excess, let the precipitate completely subside, pour off the supernatant fluid, collect the precipitate on a filter, and wash it with distilled water till the fluid passes colourless. Diffuse the moist precipitate through twelve fluid ounces of distilled water, and add gradually, with diligent stirring, sufficient hydrochloric acid to make the fluid feebly but persistently acid. Then add the animal charcoal, digest at a gentle heat for twenty minutes, filter, and allow the liquid to cool. Add ammonia in slight excess, and when the precipitate has completely subsided, pour off the supernatant liquid, collect the precipitate on a filter, and wash it with cold distilled water till the washings cease to be affected by nitrate of silver acidulated with nitric acid. Lastly, dry the precipitate first by imbibition with filtering paper, and then by the application of a gentle heat.*

*Characters.*—Pale grey, amorphous, without smell, but even in the most minute quantity, powerfully irritating the nostrils; strongly and persistently bitter, and highly acrid; insoluble in water, and soluble in spirit and ether, in diluted acids, leaving traces of an insoluble brown resinoid matter. An active poison.

UNGUENTUM VERATRIÆ—OINTMENT OF VERATRIA.—*Take of veratria,* 8 *grains; prepared lard,* 1 *ounce; olive oil,* ½ *fluid drachm. Rub the veratria and the oil together; then mix them thoroughly with the lard.*

*Therapeutics.*—Cevadilla and the alkaloid veratria act in over-doses as powerful irritant poisons, producing severe pain, vomiting, purging, and other symptoms similar to those of poisoning by colchicum, the treatment in both cases being the same. There is no officinal preparation of cevadilla for internal use, and it is rarely given; but it has been recommended as an anthelmintic in tape-worm and ascarides. Veratria is very rarely given internally, although it has been recommended as a substitute for colchicum in gout and rheumatism; also for the relief of certain painful neuralgic affections, and as an antiphlogistic in inflammatory diseases. When applied to the nostrils, even in minute quantity, it acts powerfully as a sternutatory and an errhine. Externally, it acts as a topical irritant, producing tingling in the part, and as such has been recommended in rheumatism, in neuralgia, in paralysis, in scrofulous diseases of the joints, in diseases of the eye (taking care to keep it away from the conjunctiva), &c. *Dose*, $\frac{1}{12}$ to $\frac{1}{6}$ grain.

VERATRI VIRIDIS RADIX—THE DRIED RHIZOME OF VERATRUM VIRIDE.—Green Hellebore, Swamp Hellebore, Indian Poke. Collected in autumn in the United States and Canada.

*Characters.*—Thick fleshy rhizome, with numerous pale yellow radicles, peculiar acrid, bitter taste, causing a sensation of tingling about the fauces.

It seems to owe its activity to Veratria, which exists in it as Gallate of Veratria. Officinal preparation: *Tinctura Veratri Viridis.*

TINCTURA VERATRI VIRIDIS—TINCTURE OF GREEN HELLEBORE.—*Take of green hellebore root, in coarse powder,* 4 *ounces; rectified spirit,* 1 *pint. Macerate the hellebore for forty-eight hours in fifteen fluid ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of spirit. Afterwards subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient rectified spirit to make one pint. Dose,* 5 *to* 20 *mins.*

*Therapeutics.*—The therapeutic value of this drug has undoubtedly been much overrated. It requires very great care in its administration to prevent the serious depression and distressing nausea resulting from its use being carried to a dangerous degree. It acts as a sedative and antiphlogistic, but it is very questionable whether the sedative effect induced by it on the circulation is not too dearly bought by the nausea and disagreeable results which it produces.

**PALMÆ**—The Palm Order.

**Areca**—Areca Nut.—The seed of *Areca Catechu*; The Betel-nut Tree. Imported from the East Indies.

*Dose.*—In powder, one-half to three-quarter ounce.

*Therapeutics.*—Areca nut contains a large amount of tannin, and, therefore, is astringent. Mixed with lime and the leaves of the piper betel, it forms the famous Oriental masticatory, Betel. Areca nut, both as a constituent of betel and used alone, has been found useful in the diarrhœa of debility. It is credited also with vermicide properties, but its anthelmintic powers are feeble and uncertain.

**GRAMINEÆ**—The Grass Order.—Herbaceous plants, forming herbage in temperate climates, and sometimes becoming arborescent in tropical countries. The order furnishes most important food substances both for man and animals. Officinal plants: *Triticum vulgare, Hordeum distichon, Secale cereale, Saccharum officinarium.*

**Farina Tritici**—Flour—Wheat Flour.—The grain of wheat, *Triticum vulgare*, ground and sifted.

**Mica Panis**—Crumb of Bread.—The soft part of bread made with wheaten flour.

**Amylum**—Wheat Starch.—Officinal plant: *Triticum vulgare;* Starch, procured from the seed.

*Botany.*—*Culms*, simple, glaucous, jointed. *Spike*, four-cornered, imbricated. *Spikelets*, generally four-flowered; flowers, distichous. *Glumes*, two, opposite, equal, ribbed. *Grain*, free, convex externally, marked with a deep furrow internally. *Habitat*, Tartary; widely cultivated.

Wheat flour consists of starch, gluten, sugar, gum, and water, in varying proportions. By kneading the flour in water, its starch is washed out, and may thus be separated and collected. Starch constitutes from sixty to seventy per cent., and gluten from ten to twelve per cent. of flour. The latter is a compound substance, consisting of albumen and vegetable fibrine.

*Characters of Starch* ($C_6H_{10}O_5$).—In white columnar masses. When rubbed in a Wedgewood mortar with a little cold distilled water, it is neither acid nor alkaline to test-paper, and the filtered liquid does not become blue on the addition of solution of iodine. Mixed with boiling water and cooled, it gives a deep blue colour with iodine.

GLYCERINUM AMYLI—GLYCERINE OF STARCH.—*Take of starch, 1 ounce; glycerine, 8 fluid ounces. Rub them together until they are intimately mixed, then transfer the mixture to a porcelain dish and apply a heat, gradually raised to 240°, stirring it constantly until the starch particles are completely broken, and a translucent jelly is formed.*

*Therapeutics.*—This preparation, which is about the consistence of an ointment, has been long used on the Continent, but was introduced into this country only a few years ago, by Mr. Schacht of Clifton, under the name of "Plasma." It is well suited to replace ointment as a menstruum for applying medicinal substances to the skin, where an oily basis is objectionable, being more cleanly, and not liable to become rancid. It does not seem to have as yet met with that attention it deserves.

MUCILAGO AMYLI—MUCILAGE OF STARCH.—*Take of starch,* 120 *grains; distilled water,* 10 *fluid ounces. Triturate the starch with the water, gradually added, then boil for a few minutes, constantly stirring.*

*Therapeutics.*—Medicinally flour is employed for dusting over excoriated, burned, and inflamed surfaces. Bread-crumb is occasionally used in the formation of pills. Starch powder may be used externally for the same purposes as wheat flour; the decoction of starch is employed as a demulcent, as a vehicle for enemata, as an antidote in poisoning by iodine. Mucilage of starch enters into all the officinal enemata, except that of tobacco. Starch enters into compound tragacanth powder. Wheat flour, bread, and starch are far more important as nutritive articles of diet than as articles of medicine and pharmacy.

**Hordeum Decorticatum**—Pearl Barley.—Officinal plant: *Hordeum distichon;* Two-rowed, or Long-eared Barley. Officinal part: The husked seeds; cultivated in Britain.

*Characters of the Grain.*—White, rounded, retaining a trace of the longitudinal furrow.

When the husk merely is removed, it is known as Scotch, hulled, or pot-barley; but when the seeds are entirely deprived of their integuments, and are furthermore rounded and polished, it is termed pearl barley. Barley consists of starch, gluten, albumen, uncrystallizable sugar, gum, &c.

DECOCTUM HORDEI—DECOCTION OF BARLEY.—*Take of pearl barley,* 2 *ounces; distilled water,* 1½ *pint. Wash the barley in cold water, and reject the washings; boil the washed barley with the distilled water for twenty minutes in a covered vessel, and strain.*

*Dose.—Ad libitum.*

*Therapeutics.*—Decoction of barley is used as a demulcent drink in febrile and inflammatory diseases, and as a vehicle for other medicines. It is most frequently employed in inflammatory affections of the respiratory and urinary organs. Raisins, sugar-candy, liquorice-root, and slices of lemons, are sometimes added.

**Ergota**—Ergot.—(*Secale cornutum*—Spurred Rye).—Officinal part: The sclerotium (compact mycelium or spawn) of Claviceps purpurea, *Tulasne,* produced within the paleæ of the common rye, Secale cereale.

The true nature of ergot has been explained by the researches of Tulasne and others. Ergot is a disease of the grain due to a fungus, and Tulasne has shown beyond doubt that it is induced by the mycelium or spawn of the claviceps purpurea, and that there are three stages of the development of the fungus—(1.) The sphacelium; (2.) the sclerotium or ergot; (3.) the claviceps purpurea; these three forms being merely successive states of development of the same biennial fungus. The sclerotium or ergot being the middle state, a special state of rest of these plants which occurs in a large number of fungi, and which, under favourable conditions, developes into the third stage, the fully developed claviceps purpurea.

*Characters.*—Subtriangular, curved, with a longitudinal furrow on the concave side, obtuse at the ends; from one-third of an inch to an inch and a-half in length; of a violet-brown colour on the surface, pinkish within, solid, frangible, fracture short, odour faintly marked, but strong if the powder be triturated with solution of potash.

Ergot yields its active properties to boiling water, spirit, and ether. Its peculiar odour is due to a volatile alkaloid, trimethylamine ($C_3H_9N$). It also contains 35 per cent. of a fixed oil, inactive *per se*, although the active principle may be extracted with it, and remaining dissolved, render it active. What is termed ergotin, a reddish-brown substance, is nothing but a concentrated watery extract, which, while it contains the active principle, is not the active principle itself, or of definite chemical composition. So that the chemistry of ergot is not yet worked out, unless the researches of Dragendorff, 1876, prove correct, which ascribe its activity to scleromucin and sclerotic acid, the latter of which is colourless, odourless, and readily soluble in water. According to Draggendorff, Professor Von Holst has used it successfully, administered subcutaneously in doses of from 0·04 to 0·05 grammes.

EXTRACTUM ERGOTÆ LIQUIDUM—LIQUID EXTRACT OF ERGOT.—*Take of ergot, in coarse powder,* 1 *pound; ether,* 1 *pint, or a sufficiency; distilled water,* 3½ *pints; rectified spirit,* 8 *fluid ounces. Shake the ether in a bottle with half-a-pint of the water, and after separation decant the ether. Place the ergot in a percolator, and free it from its oil by passing the washed ether slowly through it. Remove the marc, and digest it in three pints of the water at* 160° *for twelve hours. Press out, strain, and evaporate the liquor by the heat of a water-bath to nine fluid ounces; when cold, add the spirit. Allow it to stand for an hour to coagulate, then filter. The product should measure sixteen fluid ounces. Dose,* 10 *to* 60 *mins.*

INFUSUM ERGOTÆ—INFUSION OF ERGOT.—*Take of ergot, in coarse powder,* ¼ *ounce; boiling distilled water,* 10 *fluid ounces. Infuse in a covered vessel for half-an-hour, and strain. Dose,* 2 *ounces.*

TINCTURA ERGOTÆ—Tincture of Ergot.—*Take of ergot, in coarse powder, 5 ounces; proof spirit, 1 pint. Macerate the ergot for forty-eight hours in fifteen ounces of the spirit in a closed vessel, agitating occasionally; then transfer to a percolator, and when the fluid ceases to pass, continue the percolation with the remaining five ounces of the spirit; afterwards subject the contents of the percolator to pressure; filter the product, mix the liquids, and add sufficient proof spirit to make one pint. Dose, 10 to 60 mins.*

*Therapeutics.*—Ergot of rye in over-doses occasions nausea, vomiting, colicky pains, headache, and occasionally delirium and stupor. When taken for a length of time, as in bread made with diseased rye, it produces two conditions, termed gangrenous ergotism and convulsive ergotism. In medicinal doses it acts especially on the circulation and on the impregnated uterus. On the circulation it causes arterial contraction, due probably to a direct action on the muscular walls of the arteries, as it is independent of the vaso-motor centres, inasmuch as division of the sympathetic nerve does not affect it. It also causes contraction of the bladder, increased peristaltis and contraction of the uterus, probably due to its action on unstriped muscular fibre. Upon the uterus of parturient women, ergot has a very decided action, increasing the length and force of the pains, and in a sufficient dose inducing a tetanic condition of the whole organ. But it must be borne in mind that the uterine contraction caused by ergot differs from normal pains in being more continuous and not interrupted, and more liable to prove injurious to both mother and child unless it be prescribed with discretion. The danger to the mother consists in the risk of rupture of the uterus or laceration of the perinæum. This, however, is not nearly so great as the risk to the child, because these continuous uterine contractions induced by ergot, endanger the life of the child by interfering with or arresting the circulation between the placenta and fœtus, so that the fœtus may die from asphyxia unless delivery occur very speedily. That the danger to the child is a real one, and not merely hypothetical, is shown by the results of the committee of the French Academy of Medicine, who investigated the subject, and who adopted the conclusions of M. Depaul—viz., that except in miscarriage, in certain labours attended with hemorrhage, and as the conclusion of natural labours, parturient women would be gainers by the complete disuse of ergot.

These considerations show that ergot should not be given during labour in inertia of the uterus if there is much resistance to the birth of the fœtus, as in primiparæ; even in other pregnancies it should only be given when there is no obstruction to the birth of the fœtus, except inertia of the uterus, and when second stage of labour is nearly concluded. By causing uterine contraction, it aids the expulsion of the placenta or clots of blood, it prevents or aids in arresting hæmorrhage—the dose for these purposes should be ʒi. of the liquid Ext. But in sudden hæmorrhage ergotin should be injected subcutaneously into the buttock to save time, or when in post-partum hæmorrhage vomiting is present, as it frequently is. Ergot has been, however, found to induce contraction of the small arteries generally, hence it is used successfully as a hæmostatic in cases of hæmoptysis, &c., and to diminish congestion, especially in sub-inflammatory affections of the cerebro-spinal membranes. The subcutaneous injection of ergotin, in cases of hæmoptysis and in bleeding from small vessels generally, has been followed with very great success. It is injected in doses of three grains and upwards. It is best to suspend the ergotin in water with a little glycerine, as, if spirit be employed to dissolve the ergotin, it is apt to irritate the part into which it is injected, and to form a painful abscess. A good strength for one injection is three grains of ergotin with five drops of glycerine, made up to half a drachm by the addition of distilled water. It ought to be injected into the substance of a muscle, such as the pectoralis or the deltoid, as thereby it is much less likely to cause pain or to set up suppuration than if it is thrown into the connective tissue. Ergot is also employed to cause the expulsion of sanguineous clots, hydatids, and polypi from the uterus, to arrest uterine hæmorrhage at other times, to remedy malpositions of the uterus, to promote involution of the same, or to check leucorrhœa, &c.

**Saccharum Purificatum**—Refined Sugar ($C_{12}H_{22}O_{11}$).—Officinal plant: *Saccharum officinarum*; the Sugar Cane. Officinal part: The crystallized refined juice of the stem; from plants cultivated in the West Indies and other tropical countries.

*Characters.*—Compact, crystalline, conical loaves; known in commerce as lump sugar.

**Theriaca**—Treacle.—The uncrystallized residue of the refining of sugar. Sacchari Faex, L.

*Characters.*—A thick, brown, fermentable syrup, very sweet; not crystallizing by rest or evaporation. Specific gravity about 1·40. Nearly free from empyreumatic odour or flavour.

SYRUPUS—SYRUP.—*Take of refined sugar,* 5 *pounds; distilled water,* 2 *pints. Dissolve the sugar in the water with the aid of heat, and add, after cooling, as much distilled water as may be necessary to* *make the weight of the product seven pounds and a-half. The specific gravity should be* 1·330.

*Therapeutics.*—Sugar is used in medicine as a flavouring adjunct to other remedies, and is itself both nutrient and demulcent. It is also employed as a demulcent antidote in irritant and corrosive poisoning. It is employed in pharmacy for a variety of purposes, such as to impart cohesiveness, to give consistence, to suspend insoluble substances, to preserve certain articles from chemical changes, &c. It enters into syrups, confections, lozenges, powders, pills, mixtures, &c. Treacle is used in the preparation of certain pill masses.

## CLASS III.—ACOTYLEDONES.

### SUB-CLASS I.—ACROGENÆ.

**FILICES**—The Fern Order.—The plants possess anthelmintic, demulcent, astringent, and other properties. Officinal plant: *Aspidium Filix-mas.*

**Filix**—Fern Root.—Officinal plant: *Aspidium Filix-mas.*, Swartz.; Male Shield Fern. Officinal part: The indigenous rhizome, with the bases of the footstalks and portions of the root fibre, dried; collected in summer.

*Botany.*—Herbaceous plant. *Rhizome*, perennial, subterraneous, thick, tufted, scaly, with descending roots, and ascending leaves or fronds. *Fronds*, three or four feet high, bipinnate, rising in a circle from the tufted rhizome; pinnules, oblong, obtuse, serrated. *Habitat*, indigenous.

*Characters.*—Tufted, scaly, greenish-brown; powder, greenish-yellow, with a disagreeable odour, and a nauseaus, bitter, somewhat astringent taste.

The rhizome should be carefully dried and powdered, and be kept from the atmosphere in well-stoppered bottles. The chief constituents of the rhizome are a volatile oil, a fixed oil, resin, starch, gum, tannic acid and filicic acid, a colourless crystalline body regarded by Bucheim as the active principle.

EXTRACTUM FILICIS LIQUIDUM—LIQUID EXTRACT OF MALE FERN.—*Take of male fern, in coarse powder, 2 pounds; ether, 4 pints, or a sufficiency. Pack the male fern closely in a percolator, and pass the ether slowly through it until it passes colourless. Let th ether evaporate on a water-bath, or recover it by distillation, and preserve the oily extract. Dose,* ʒss. *to* ʒiii.

*Dose.*—Of the powder, sixty to one hundred and eighty grains.

*Therapeutics.*—Male fern is employed as an anthelmintic, and when good preparations are employed, is perhaps the most successful remedy in the treatment of tape-worm. It is equally efficacious in the three kinds of tape-worm, but the dose should be larger than is stated in the Pharmacopœia, ʒss. to ʒiii. may be given in the form of emulsion, and is to be taken with milk in the morning, fasting, and followed in an hour or two by a dose of castor oil or senna. It usually acts promptly, and without causing any uneasiness, but occasionally it gives rise to nausea and griping pains.

### SUB-CLASS II.—THALLOGENÆ.

**Lichens**—The Lichen Order.—Cellular plants growing on stones, on the surface of the earth, or on trees, widely distributed. They possess mucilaginous, nutrient, bitter, astringent, and other properties. Officinal plants: *Cetraria islandica,* various species of *Rocella.*

**Cetraria**—Iceland Moss.—Officinal plant: *Cetraria islandica.* Officinal part: The entire lichen; native of the north of Europe.

*Botany.*—*Thallus,* erect, two to four inches high, foliaceous, dry leathery, tufted, and irregularly divided; divisions channelled, lobed, fringed. *Apothecia,* or fructifications, brown, shield-like or flat, with elevated border. *Habitat,* mountains of the Old and New World.

*Characters.*—Foliaceous, lobed, crisp, cartilaginous, brownish-white, paler beneath, taste bitter and mucilaginous. A strong decoction gelatinises on cooling.

Iceland moss has a faint peculiar odour when fresh, but is almost inodorous when dry. It has a mucilaginous and rather bitter taste; it forms a whitish-grey powder, and swells up in cold water, to which it yields its mucilaginous and bitter properties. It contains a large quantity of starchy matter in the forms of *lichenin* and *inulin,* the former of which gives a blue colour with iodine, whilst the latter does not; it also contains a bitter principle which has acid properties, and is termed *Cetraric acid.*

DECOCTUM CETRARIÆ—DECOCTION OF ICELAND MOSS.—*Take of Iceland moss,* 1 *ounce; distilled water,* 1 *pint. Wash the moss in cold water to remove impurities; boil it with the distilled water for ten minutes in a covered vessel, and strain with gentle pressure while hot. Then pour distilled water over the contents of the strainer until the strained product measures a pint.*

*Dose.*—One to two fluid ounces.

*Therapeutics.*—Iceland moss acts as a demulcent non-astringent tonic, and when deprived of its bitter principle, is used as an article of diet.

**Litmus**—A blue pigment, prepared from various species of *Rocella*, D.C.

LITMUS PAPER BLUE.—*Unsized white paper steeped in tincture of litmus, and dried by exposure to the air.*

LITMUS PAPER RED.—*Unsized paper steeped in tincture of litmus which has been previously reddened by the addition of a very minute quantity of sulphuric acid, and dried by exposure to the air.*

LITMUS TINCTURE.—*Take of litmus, in powder,* 1 *ounce; proof spirit,* 10 *fluid ounces. Macerate for two days in a closed vessel, and filter.*

Litmus, which, with its preparations, is placed in Appendix I. of the Pharmacopœia, is used only as a test for acids and alkalies, the acids giving a red colour with blue litmus; the alkalies restoring the blue colour of reddened litmus.

## DIVISION II.—ANIMAL KINGDOM.

The articles of the Materia Medica which are derived from the animal kingdom being comparatively few in number, are here given in alphabetical order.

**Hog's Fat.**—The internal fat of the abdomen of the hog, *Sus scrofa*, Linn. (class MAMMALIA, order *Pachydermata*).

ADEPS PRÆPARATUS—PREPARED LARD.—Axungia, *Edin. The purified fat of the hog, sus scrofa, Linn.*

PREPARATION.—*Take of the internal fat of the abdomen of the hog, perfectly fresh,* 14 *pounds. Remove as much of the membranes as possible, cut the fat into small pieces, put it into a suitable vessel with about four gallons of cold water, and while a current of water is running through the vessel, break up the masses of fat with the hands, exposing every part to the water, so that whatever is soluble may be thus dissolved and carried away. Afterwards collect the washed fat on a sieve or in a cloth, drain away as much as possible of the water, liquefy the fat at a heat not exceeding* 212°, *and strain through flannel, pressing the residue while hot; then put it into a pan heated by steam, and keep it at a temperature a little but not much above* 212°, *stirring it continually, until it becomes clear and entirely free from water; finally, strain it through flannel.*

*Characters.*—A soft white fatty substance, melting at about 100°. Has no rancid odour; dissolves entirely in ether.

**Adeps Benzoatus**—Benzoated Lard.

PREPARATION.—*Take of prepared lard,* 1 *pound; benzoin, reduced to coarse powder,* 160 *grains. Melt the lard by the heat of a water-bath, add the benzoin, and frequently stirring them together, continue the application of heat for two hours; finally, remove the residual benzoin by straining.*

*Therapeutics.* — Uses are the same as those of simple lard. The benzoin is added to prevent the lard from becoming rancid, which it is very apt to do otherwise.

UNGUENTUM SIMPLEX—SIMPLE OINTMENT.—*Take of white wax,* 2 *ounces; prepared lard,* 3 *ounces; almond oil,* 3 *fluid ounces. Melt the wax and the lard in the oil on a water-bath; then remove the mixture, and stir constantly while it cools.*

*Therapeutics.*—Prepared lard is used only externally as an emollient; it forms the basis of nearly all the officinal ointments, enters into the officinal suppositories, and into cantharides plaster. Simple ointment is employed as an emollient, and is usually applied as a healing dressing to blistered surfaces.

**Cantharis**—Cantharides.—*Cantharis vesicatoria.*—The blister beetle or Spanish fly, dried; collected in Russia, Sicily, and Hungary.

*Characters.*—From eight to ten lines long, furnished with two wing-covers of a shining metallic-green colour, under which are two membraneous transparent wings; odour strong and disagreeable; powder greyish-brown, containing shining green particles.

The Blister Beetle or Spanish Fly belongs to the class Insecta and the order Coleoptera; it is an inhabitant of southern Europe, especially Italy and Spain, and is also met with in France, Russia, Siberia, Germany, Hungary, and elsewhere, those which are now brought to this country being collected chiefly in Russia, Sicily, and Hungary. The insects are found feeding upon the leaves of certain species of *Oleaceæ,* as the ash, privet, and lilac, and of *Caprifoliaceæ,* as the elder and honeysuckle. They are collected in the months of May and June, either in the morning or the evening, when they are less alert. Cloths are spread under the trees, which are then either shaken or beaten by persons whose faces and hands are protected; the insects fall into the cloths and are immediately killed, either by the vapour of vinegar, or by placing them in air-tight vessels, with or without a little oil of turpentine, or by immersing the cloths containing them in hot vinegar and water, or by other means, and they are then dried. Cantharides are liable to the attack of mites and other insects; and in order to preserve them from these, they are to be kept in well-stoppered bottles or air-tight boxes, in which a few drops of strong acetic acid, or a little camphor or other preservative, is also placed. The insects may be recognised by the officinal characters; they are easily reduced to a greyish-brown powder, in which, upon careful examination, however finely it may be divided, the shining green particles of the *elytræ* may be detected, a point of no little importance in medico-legal investigation. The active principle of Cantharides is *Cantharidin* ($C_5H_6O_2$), which may be obtained in white micaceous scales; when isolated it is insoluble in water, but in the insect it probably exists as a soluble compound, for the active properties are to a certain extent yielded to water; it is soluble in ether, chloroform, and strong acetic acid, and, to a less extent, in cold alcohol. It is exceedingly poisonous, causing violent inflammation in parts touched by it. Besides cantharidin, the beetles contain oily and fatty matter.

## Acetum Cantharidis—Vinegar of Cantharides.

PREPARATION.—*Take of cantharides, in powder, 2 ounces; glacial acetic acid, 2 fluid ounces; acetic acid, 18 fluid ounces, or a sufficiency. Mix thirteen fluid ounces of the acetic acid with the glacial acetic acid, and digest the cantharides in this mixture for two hours at a temperature of 200°; then transfer the ingredients, after they have cooled, to a percolator, and when the liquid ceases to pass, pour five fluid ounces of acetic acid over the residuum in the apparatus. As soon as the percolation is complete, subject the contents of the percolator to pressure, filter the product, mix the liquids, and add sufficient acetic acid to make one pint.*

*Therapeutics.*—This preparation contains eight times as much cantharides as the tincture. It is a prompt vesicant, but too strong for internal use.

## Charta Epispastica—Blistering Paper.

PREPARATION.—*Take of white wax, 4 ounces; spermaceti, 1½ ounce; olive oil, 2 fluid ounces; resin ¾ ounce; Canada balsam, ¼ ounce; cantharides, in powder, 1 ounce; distilled water, 6 fluid ounces. Digest all the ingredients, excepting the Canada balsam, in a water-bath for two hours, stirring them constantly, then strain, and separate the plaster from the watery liquid. Mix the Canada balsam with the plaster* *melted in a shallow vessel, and pass strips of paper over the surface of the hot liquid, so that one surface of the paper shall receive a thin coating of plaster.*

EMPLASTRUM CANTHARIDIS—CANTHARIDES PLASTER.—*Take of cantharides, in powder,* 12 *ounces; yellow wax, prepared suet, of each,* 7½ *ounces; resin,* 3 *ounces; prepared lard,* 6 *ounces. Liquefy the wax, suet, and lard together by a water-bath, and add the resin, previously melted; then introduce the cantharides, mix the whole thoroughly, and continue to stir the mixture while it is allowed to cool.*

EMPLASTRUM CALEFACIENS—WARM PLASTER.—*Take of cantharides, in coarse powder, expressed oil of nutmeg, yellow wax, resin, of each,* 4 *ounces; soap plaster,* 3¼ *pounds; resin plaster,* 2 *pounds; boiling water,* 1 *pint. Infuse the cantharides in the boiling water for six hours; squeeze strongly through calico, and evaporate the expressed liquid by a water-bath, till reduced to one-third. Then add the other ingredients, and melt in a water-bath, stirring well until the whole is thoroughly mixed.*

LIQUOR EPISPASTICUS—BLISTERING LIQUID.—Linimentum Cantharidis, 1864.—*Take of cantharides, in powder,* 8 *ounces; acetic acid,* 4 *fluid ounces; ether, a sufficiency. Mix the cantharides and acetic acid; pack them in a percolator, and at the expiration of twenty-four hours pour ether over the contents of the percolator, and allow it to pass slowly through till twenty fluid ounces are obtained. Keep it in a stoppered bottle.*

TINCTURA CANTHARIDIS—TINCTURE OF CANTHARIDES.—*Take of cantharides, in coarse powder,* ¼ *ounce; proof spirit,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation, strain, press, filter, and add sufficient proof spirit to make one pint. Dose,* 5 *to* 20 *mins.*

UNGUENTUM CANTHARIDIS—OINTMENT OF CANTHARIDES.—Ceratum Cantharides, *Lond.*—*Take of cantharides, yellow wax, of each,* 1 *ounce; olive oil,* 6 *fluid ounces. Infuse the cantharides in the oil, in a covered vessel, for twelve hours, then place the vessel in boiling water for fifteen minutes, strain through muslin with strong pressure, add the product to the wax, previously melted, and stir constantly while the mixture cools.*

*Therapeutics.*—Cantharides act in over-doses as a powerful irritant poison, causing inflammation of the mucous membrane of the alimentary canal, attended by excruciating pain, vomiting and purging, and the discharge of blood and disorganised tissue, and after absorption is causes severe pain in the loins with strangury. In medicinal doses, cantharides act chiefly upon the genito-urinary organs, stimulating the parts, and causing an increased flow of urine; in over-doses, and in some persons in small doses, or even when applied externally only, they are apt to produce strangury. They have been employed as diuretics, and have been recommended also in incontinence of urine from paralysis of the bladder, in the incontinence of urine of children, in gleet, in leucorrhœa, &c.; but their use internally requires great caution, and they are contra-indicated both internally and externally in acute inflammatory and irritable states of the genito-urinary organs. They are said to increase the sexual desires, and have been secretly given for that purpose—a practice which is not less dangerous than immoral; for, according to Professor Christison, poisonous doses are required to produce the effect. But cantharides are commonly used as external topical irritants, for the purpose of rubefaction or vesication. They are employed as counter-irritants, derivatives, and local and general stimulants, in the vast number of cases in which such treatment is indicated. Treatment of an over-dose consists in emollient and demulcent drinks, with opiates to allay the pain. The plaster of cantharides (vulgarly called fly blister or rising blister) is employed as a vesicant. The plaster is usually kept on from eight to twelve hours, after which it is removed, the vesicle is clipped at its most depending margin, and the part is dressed with spermaceti or simple ointment, or the cuticle may be removed altogether, and the surface be dressed with a thick layer of raw cotton, beneath which it heals rapidly. When a perpetual blister is desired, the part is dressed with the ointment of cantharides, ointment of savin, or other irritant. Sometimes the cantharides plaster is only allowed to remain on for five or six hours, vesication being promoted by the subsequent application of a poultice. Certain precautions are necessary in the application of blisters, especially to children, to aged and debilitated persons, and to persons with a particularly sensitive skin. The charta epispastica is in effect similar to the emplastrum cantharidis. Warm plaster is used as a stimulant and rubefacient. Liquor Epispasticus is used as a prompt vesicant in cases in which rapidity of action is required, or in which either the nature of the part to be affected or the condition of the patient is unsuited to the plaster. It is applied by means of a camel's-hair brush, two or three coatings being given when prompt action is required; when scantily applied, it acts as a rubefacient. The acetum may be used for vesication also. Ointment of cantharides is used as a counter-irritant, and as an irritant dressing to blistered surfaces, issues, ulcers, &c.

**Castoreum**—CASTOR—*Castor Fiber*, Linn. (class MAMMALIA, order *Rodentia*). *The Beaver.—The preputial follicles and their secretion, dried, separated from the somewhat shorter and smaller oil sacs which are frequently attached to them; from Hudson's Bay territory.*

*Characters.*—Follicles in pairs, about three inches long, fig-shaped, firm, and heavy, brown or greyish-black; containing a dry resinous reddish-brown or brown, highly odorous secretion, in great part soluble in rectified spirit and in ether.

Castor has a strong peculiar odour, and a bitter aromatic taste. It contains besides other ingredients, a volatile oil, and a peculiar white, crystalline, fatty substance, termed *Castorin.* Castor yields its active properties to alcohol and to ether, but very sparingly so to water.

TINCTURA CASTOREI—TINCTURE OF CASTOR.—*Take of castor, in coarse powder,* 1 *ounce; rectified spirit,* 1 *pint. Macerate for seven days in a closed vessel, with occasional agitation; strain, press, filter, and add sufficient rectified spirit to make one pint. Dose,* ʒss. *to* ʒii.

*Therapeutics.*—Castor was formerly esteemed as an antispasmodic, in the treatment of nervous, spasmodic, and hysterical cases; but it is seldom used now, and is probably inert.

**Cera Flava**—Yellow Wax.—*Apis mellifica*, Linn. (class INSECTA, order *Hymenoptera*); the Hive Bee. The prepared Honeycomb; British and imported.

*Characters.*—Firm, breaking with a granular fracture, yellow, having an agreeable honey-like odour. Not unctuous to the touch; does not melt under 140°; yields nothing to cold rectified spirit, but is entirely soluble in oil of turpentine. Boiling water, in which it has been agitated, when cooled, is not rendered blue by iodine.

**Cera Alba**—White Wax.—Yellow Wax, bleached by exposure to moisture, air, and light; British and imported.

*Characters.*—Hard, nearly white, translucent. Not unctuous to the touch; does not melt under 150°. Officinal preparation: *Unguentum Simplex.*

*Therapeutics.*—Wax acts as an emollient, and has been given internally in cases of ulceration of the bowels; but it is rarely used otherwise than as an external application, and is added to many of the officinal ointments and preparations.

**Cetaceum**—Spermaceti—*Physeter macrocephalus*, Linn. (class

MAMMALIA, order *Cetacea*).—The sperm whale, inhabiting the Pacific and Indian Oceans. Nearly pure cetine, separated by cooling and purification from the oil contained in the head.

*Characters.*—Crystalline, pearly-white, glistening, translucent, with little taste or odour, reducible to powder by the addition of a little rectified spirit. Scarcely unctuous to the touch; does not melt under 100°. Officinal preparation: *Unguentum Cetacei;* enters into the constitution of *Charta Epispastica.*

UNGUENTUM CETACEI—OINTMENT OF SPERMACETI.—*Take of spermaceti, 5 ounces; white wax, 2 ounces; almond oil, 1 pint, or a sufficiency. Melt together with a gentle heat, remove the mixture, and stir constantly while it cools.*

*Therapeutics.*—Spermaceti ointment is employed as an emollient and cooling application to vesicated and excoriated surfaces.

**Coccus**—Cochineal—*Coccus Cacti*, Linn. (class INSECTA, order *Hemoptera*).—The female insect, dried; reared in Mexico and Teneriffe.

*Characters.*—Ovate, plano-convex, about two lines long, wrinkled, black, or greyish-white; yields, when crushed, a puce-coloured powder. The greyish-white insect quickly becomes black when warmed before the fire.

In Mexico, Vera Cruz, the Canary Islands, Algeria, and other parts whence the cochineal insects are obtained, large plantations of the Nopal (*Opuntia cochillinifera*) are cultivated for them to feed upon. The insects are carefully reared, and the females are placed upon the cactus tree to bring forth their young. When they arrive at a proper age, and the young female insects have become fecundated, the collection takes place, the insects being swept off the trees and destroyed by immersion in boiling water, and then dried. Cochineal is inodorous, but has a somewhat bitter taste. They contain, besides other constituents, a rich purplish-red colouring matter (*Cochinillin*), which forms the basis of carmine.

TINCTURA COCCI—TINCTURE OF COCHINEAL.—*Take of cochineal, in powder, 2½ ounces; proof spirit, 1 pint. Macerate for seven days in a closed vessel, with occasional agitation, strain, press, filter, and add sufficient proof spirit to make one pint.*

*Therapeutics.*—Cochineal was formerly employed as an anodyne and antispasmodic, and was used in neuralgia, whooping-cough, &c.; but it is now employed only as a colouring adjunct to other medicines.

**Fel Bovinum**—Ox Bile—Ox Gall.—The fresh bile of the ox, *Bos Taurus*, Linn. (class MAMMALIA, order *Ruminantia*).

**Fel Bovinum Purificatum**—Purified Ox Bile.—PREPARATION.—*Take of fresh ox bile, 1 pint; rectified spirit, 2 pints. Mix the bile and the spirit, by agitation, in a bottle, and set aside for twelve hours until the sediment subsides. Decant the clear solution, and evaporate it in a porcelain dish by the heat of a water-bath until it acquires a suitable consistence for forming pills.*

*Characters.*—A yellowish-green substance, having a taste partly sweet and partly bitter, soluble in water and in spirit. A solution of one or two grains of it, in about a fluid drachm of water, when treated, first with a drop of freshly-made syrup, consisting of one part of sugar and four of water, and then with sulphuric acid, cautiously added, until the precipitate at first formed is redissolved, gradually acquires a cherry-red colour, which changes in succession to carmine, purple, and violet.

Fresh ox bile contains *glyco-cholic*, and *tauro-cholic acids*, *cholesterin*, *mucus*, &c. The tauro-cholic and glyco-cholic acids are both in combination with soda, forming two resinous soaps—viz., the taurocholate and glyco-cholate of soda. The presence of bile acids is demonstrated by the change of colour under the action of sulphuric acid and sugar. The mucous is removed by agitation with the rectified spirit.

*Dose.*—Two to five, ten, or more, grains, either in pill, in capsules, or, dissolved in warm water, as an enema.

*Therapeutics.*—Purified ox gall acts in small doses as a tonic, and in larger doses as a gentle laxative. It has been recommended in cases of dyspepsia, in which, without organic lesion, there is vomiting after meals; as a laxative, it is given when the secretion of bile is deficient. It is more commonly used as an adjunct to aperient pill masses.

**Hirudo**—The Leech.—1. *Sanguisuga medicinalis*, Savigny—the Speckled Leech; and 2. *S. officinalis*, Sav.—the Green Leech; collected in Spain, France, Italy, and Hungary.

*Characters.*—Body elongated, two or three inches long, tapering to each end, plano-convex, wrinkled transversely; back, olive-green, with six rusty-red longitudinal stripes. 1. Belly, greenish-yellow, spotted with black; 2. Belly, olive-green, not spotted.

Leeches abstract from a drachm to half-an-ounce of blood, according to the kind employed, and their condition at the time, the average loss of blood by each leech, including the subsequent hæmorrhage, being about half-an-ounce. Leeches often refuse to bite, and it sometimes requires considerable tact and patience in order to succeed with them. To secure their application, the part to which they are to be applied should be carefully washed, taking care to remove all trace of soap, if that be used, and lastly, if necessary, a little cream or milk may be smeared upon the skin, or a slight puncture may be made with the point of a lancet, so as to tempt them with the taste of blood. The leeches themselves should be taken out of cold water, and gently squeezed in a dry cloth. When it is desirable that a leech should attach itself to a particular spot, it may be directed to it either by means of a glass tube or *leech-glass*, or by placing upon the part a piece of blotting-paper, with a hole in it corresponding to the point to be attacked. The atmosphere of the apartment should be cool and pure; for should it be close, over-heated, or loaded with tobacco smoke or other fumes, the leeches will probably not bite. When the healthy leech has gorged itself it will drop off; but, if it be desirable to remove it sooner, a drop of water, or a grain or two of sugar or of salt, may be sprinkled upon its head. If it be desirable to take more blood than the leeches can abstract, warm poultices may be applied to the part. In order to arrest the hæmorrhage from leech-bites, the wound should be cleared of clots, and exposed to the air; if that be insufficient, pressure may be made upon them with the point of the fingers, or by pledgets of lint and a bandage; or styptics, such as matico, alum, or tannin, may be applied; or a sharp point of lunar caustic may be inserted for an instant. When these measures fail, the part should be transfixed with a needle and tied. When leeches are to be applied to any of the orifices of the body, great care must be taken to prevent their escape beyond reach. Should a leech be swallowed, port wine or common salt should be given, followed as promptly as possible by an emetic. In the case of a leech escaping into the rectum, an enema of port wine or common salt should be administered. Great care and discrimination is required in the application of leeches to children, and to adults also under certain circumstances. A child should never be put to bed at night until hæmorrhage from the leech-bites is thoroughly stopped. When many leeches are applied to a part, they should be carefully counted after their removal, otherwise one or two, which may not have taken well, may get astray, and cause serious consequences by attacking children or others during sleep. Leeches are employed for the purpose of local depletion, but they act also as derivatives. There are very many cases in which the abstaction of a comparatively small quantity of blood by leeches will afford relief which could not be procured by a general blood-letting.

**Isinglass.**—The swimming bladder or sound of various species of *Acipenser*, Linn., prepared and cut into fine shreds. Isinglass is placed in Appendix I. of the Pharmacopœia, for the preparation of a test solution, by means of which tannic acid may be distinguished and separated from gallic acid, the former giving with it a yellowish-white precipitate.

**Mel**—Honey—*Apis mellifica*, Linn. (class INSECTA, order *Hymenoptera*)—The Hive Bee.—A saccharine secretion deposited by the insect in the honeycomb; British and imported.

*Characters.*—When recently separated from the honeycomb, it is a viscid translucent liquid, of a brownish-yellow colour, which gradually becomes partially crystalline and opaque. It has a peculiar heavy odour, and a very sweet taste.

MEL DEPURATUM—CLARIFIED HONEY.—*Take of honey, 5 pounds. Melt the honey in a water-bath, and strain, while hot, through flannel, previously moistened with warm water.*

*Therapeutics.*—Honey acts as an emollient, demulcent, and laxative. It is occasionally employed internally in inflammatory affections, and as a vehicle for other medicines; but it is much more commonly used as an article of diet, and with some persons, when so taken, it serves the purpose of a laxative. Fresh honey may cause griping pains and indigestion, and poisonous effects have followed its use when obtained by the bees from deleterious plants.

**Lac**—MILK—The fresh milk of the Cow, *Bos Taurus*, Linn.—Milk enters into the preparation of *Mistura Scammonii*. Besides its nutritive qualities, milk acts as an emollient and demulcent, and is useful both as an antidote and as a protecting agent in corrosive and irritant poisoning. Milk is also possessed of diuretic properties, and besides being nutritive, is therapeutically useful in acute and chronic albuminuria. Milk with lime or Carrara water, and milk diet, form excellent adjuvants to the action of astringents in diarrhœa. Skim-milk has lately been proposed as a treatment for diabetes mellitus, and several successful cases have been reported in the journals. Externally, it is also used as a soothing application, in the form of bread-and-milk poultice, and also, mixed with warm water, as an eye-wash.

**Oleum Morrhuæ**—Cod Liver Oil.—The oil extracted from the fresh liver of the cod, *Gadus Morrhua*, by the application of a heat not exceeding 180°.

*Characters.*—Pale yellow, with a slight fishy odour, and bland fishy taste.

*Test.*—A drop of sulphuric acid added to a few drops of the oil on a porcelain slab developes a violet colour, which soon passes to a yellowish or brownish-red.

The oil is obtained from the livers of other fishes, but chiefly from that of the cod. It is largely manufactured in Newfoundland and in the north of Europe, and also to a considerable extent in this country. It is prepared in this country by carefully selecting perfectly fresh, clean, and good livers, washing them, and exposing them to a steam heat not exceeding 180°. The oil which rises to the surface is filtered, and the temperature reduced to about 50°, in order to congeal the solid fat (margarine); this is removed by a second filtration, and the oil is then preserved in air-tight jars. Three varieties of the oil are met with in commerce, *pale yellow*, *pale brown*, and *dark brown;* and of these the dark oil is the most offensive. All the varieties have a peculiar, and at first an offensive, taste and odour, but the pale yellow kind, which alone is officinal, is least offensive.

*Composition.*—Olein, 70 per cent.; palmatin (margarin), 15 per cent. Traces of iodine, bromine, and chlorine. *Acids:* Cholic, butyric, phosphoric, sulphuric, and acetic. Salts of lime, magnesia, and iron.

*Therapeutics.*—Cod liver oil is now universally used in the treatment of phthisis and other cachectic diseases, accompanied by emaciation and an impoverished state of the blood. Why this oil is superior to others in such cases is because it is more easily digested and assimilated than other oils and fats, and is therefore more nutritious in a smaller amount, and better borne by the stomach. The reason of this is that it contains the biliary and other acids, which, as has been shown by experiment, promote the absorption of fatty substances by the lacteals. Under favourable circumstances, cod liver oil fattens the patient and enriches the blood. Besides phthisis, it has been successfully employed in the treatment of tabes mesenterica, of scrofula, of scrofulous diseases of the skin, bones, and joints, of scrofulous ophthalmia, scrofulous abscesses, &c.; in the treatment of chronic rheumatism, &c. It has also been successfully employed, both internally and topically, in obstinate chronic cutaneous diseases, if associated with scrofulous or other cachectic condition. In fact, cod liver oil is not a remedy for these diseases as such, but for the condition of mal-nutrition which accompanies them, and renders them so intractable to treatment. This is shown by the circumstance that cod liver oil fails to do good in any case until it has improved the nutrition of the patient; and when it fails to do this, little benefit can be expected from its employment.

Cod liver oil is never relished at first, but by perseverance many patients are able to overcome their dislike to it. The dose to begin with should not be more than a teaspoonful, but it may be gradually raised, as the stomach will bear it, to a tablespoonful or more, three times a-day. Many plans have been recommended in order to disguise the unpleasant taste and odour of the oil, but they are of comparatively little avail, and in some cases they are such as greatly to diminish its good effects. The more simply it is taken the better; but many patients cannot tolerate it in any form as an internal remedy, and in such cases it may be introduced by inunction, but it is extremely doubtful if any, or if sufficient is absorbed to affect the nutrition of the patient, besides having the drawback of being a very disagreeable method of applying the remedy; or the liver itself, cooked and seasoned, may be tried.

**Moschus**—Musk—*Moschus moschiferus*, Linn. (class MAMMALIA, order *Ruminantia*)—Native of mountainous regions of Central Asia.—The inspissated secretion from the preputial follicles, dried; imported from China and India.

*Characters.*—In irregular reddish-black, rather unctuous grains; having a strong, peculiar, very diffusible odour, and a bitter aromatic taste; contained in a round or slightly oval membraneous sac, about two inches in diameter, covered on the outer side with stiff greyish hairs, arranged in a concentric manner around its central orifice.

Musk contains a peculiar odorous principle, ammonia, stearine, oleine, cholesterine, numerous salts, &c.

*Dose.*—Five to ten grains in pill or emulsion.

*Therapeutics.*—Musk acts as a stimulant and antispasmodic, but in consequence of its high price and liability to adulteration, it is not much employed. It has been given in hysteria, epilepsy, chorea, hooping-cough, spasmodic asthma, infantile convulsions (two to five grains as an enema), in low typhoid diseases, &c.

**Saccharum Lactis**—Sugar of Milk—($C_{12}H_{24}O_{12}$).—Crystallized sugar, obtained from the whey of milk by evaporation.

*Characters.*—Usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes; greyish-white, crystalline on the surface and in its texture, translucent, hard, scentless, faintly sweet, gritty when chewed.

*Therapeutics.*—Sugar of milk is chiefly used as a vehicle for heavy and active powders; of itself it produces no appreciable effects. It has been recommended, instead of cane sugar, for sweetening cow's milk, when the latter is administered to infants.

**Sevum Præparatum**—Prepared Suet—*Ovis Aries*, Linn.—The Sheep.—The internal fat of the abdomen, purified by melting and straining.

*Characters.*—White, smooth, almost scentless; fusible at 103°.

*Therapeutics.*—Prepared suet acts as an emollient, and is sometimes used as a substitute for prepared lard; it enters into the ointment of mercury and cantharides plaster.

**Albumen Ovi**—Egg Albumen.—*The Liquid White of the Egg of Gallus Banckiva, var domesticus.*

The liquid albumen (white) of egg is employed as a demulcent and protecting agent in corrosive and irritant poisoning, and especially as an antidote in poisoning by corrosive sublimate, sulphate of copper, and bichloride of tin. Beat up in skimmed milk, it is often found to be retained by the stomach when the irritable condition of that organ will not tolerate anything else.

**Ovi Vitellus**—Yolk of Egg.—*The Yolk of the Egg of Gallus Banckiva, var domesticus.*

Yolk of agg is of a yellow colour, coagulated by heat, and contains a peculiar albuminous principle named vitellin, which is coagulated by ether, and when in solution gives no precipitate with salts of lead or copper. Its colour is due to a yellow oil containing phosphoric acid; but it contains besides oleine, margarine, and cholesterine, with salts of iron, lime, &c. It is mild and nutritious; is employed in making *Mistura Spiritus Vini Gallici*, and in the formation of various emulsions with oily medicines, such as copaiba, oil of turpentine, &c.

**PEPSIN.**—A preparation of the mucous lining of a fresh and healthy stomach of the pig, sheep, or calf.

The stomach of one of these animals recently killed having been cut open and laid on a board with the inner surface upwards, any adhering portions of food, dirt, or other impurity, are to be removed and the exposed surface slightly washed with cold water; the cleansed mucous membrane is then to be scraped with a blunt knife or other suitable instrument, and the viscid pulp thus obtained is to be immediately spread over the surface of glass or glazed earthenware, and quickly dried at a temperature not exceeding 100°. The dried residue is to be reduced to powder and preserved in a stoppered bottle.

*Characters and Tests.*—A light yellowish-brown powder, having a faint, but not disagreeable, odour, and a slightly saline taste, without any indication of putrescence. Very little soluble in water or spirit. Two grains of it, with an ounce of distilled water, to which five minims of hydrochloric acid have been added, form a mixture in which 100 grains of hard-boiled white of egg, in thin shavings, will dissolve on their being digested together for about four hours at a temperature of 98°.

*Dose.*—Of pepsine, in powder, two to five up to fifteen grains.

*Therapeutics.*—Pepsine is the active principle of digestion in the mammalia. It acts upon the nitrogenous elements of the food, rendering them soluble. It is decomposed and rendered inert by a heat of 120°, hence the reason why, in the formula, it is ordered to be dried at a temperature not exceeding 100°. Pepsine is given in cases of atonic dyspepsia, with the view of supplementing the natural gastric juice. It is more useful in children than for adults ; in vomiting and diarrhœa from indigestion it should be given before food. The powder is the best form in which to administer it. As it only acts on the nitrogenous elements of the food, it ought not to be administered after a purely farinaceous diet.

## DIVISION III.—PRODUCTS OF FERMENTATION, OF DESTRUCTIVE DISTILLATION, &c.

**Alcohol**—Absolute Alcohol—($C_2H_6O$).—*Take of rectified spirit,* 1 *pint; carbonate of potash,* 1½ *ounce; slaked lime,* 10 *ounces. Put the carbonate of potash and spirit into a stoppered bottle, and allow them to remain in contact for two days, frequently shaking the bottle. Expose the slaked lime to a red heat in a covered crucible for half-an-hour, then remove it from the fire, and, when it has cooled, immediately put the lime into a flask or retort, and add to it the spirit, from which the denser aqueous solution of carbonate of potash, which will have formed a distinct stratum at the bottom of the bottle, has been carefully and completely separated. Attach a condenser to the apparatus, and allow it to remain without any external application of heat for twenty-four hours; then applying a gentle heat, let the spirit distil until that which has passed over shall measure one and a-half fluid ounce; reject this, and continue the distillation into a fresh receiver until nothing more passes, at a temperature of* 200°.

*Characters.*—Colourless, and free from empyreumatic odour. Specific gravity, 0·795. *Tests.*—It is entirely volatilised by heat, is not rendered turbid when mixed with water, and does not cause anhydrous sulphate of copper to assume a blue colour when left in contact with it.

SPIRITUS RECTIFICATUS — RECTIFIED SPIRIT. — Alcohol ($C_2H_6O$), with sixteen per cent. of water; obtained by the distillation of fermented saccharine fluids, and by the rectification of the product, if it be not of the proper density. Officinal preparation: *Spiritus Tenuior.*

*Characters.*—Colourless, transparent, very mobile and inflammable, of a peculiar pleasant odour, and a strong spirituous burning taste. Burns with a blue flame. Specific gravity, 0·838. Remains clear when diluted with distilled water. Odour and taste purely alcoholic. Four fluid ounces with 30 grain-measures of the volumetric solution of nitrate of silver exposed for twenty-four hours to bright light, and then decanted from the black powder which has formed, undergoes no further change when again exposed to light with more of the test.

Alcohol is obtained from sugar by what is termed *vinous fermentation,* and it may be obtained from any substance which is capable of being converted into (grape or fruit) sugar. Pure sugar dissolved in water does not undergo the change necessary to produce alcohol; it requires the presence of a nitrogenous element called a *ferment.* When sugar (*grape* or *cane,* both of which are probably converted into *fruit-sugar* before the vinous fermentation takes place) is dissolved in water, and maintained at a temperature of from 60° to 80°, in the presence of a ferment such as yeast, a change takes place: effervescence is observed, and when this has ceased, it is found that the fluid no longer contains sugar, but alcohol, carbonic-acid gas having escaped. The sugar is resolved into alcohol (51·12) and carbonic-acid gas (48·88), the ferment neither adding to nor abstracting from its constituents; thus, grape sugar, $C_6H_{12}O_6=2C_2H_6O+2CO_2$, under the action of the ferment. In the case of cane-sugar, an atom of water requires, in the first instance, to be assimilated, by which means it is converted into grape-sugar, and the fermentation goes on as before; thus, $C_{12}H_{22}O_{11}+H_2O=2C_6H_{12}O_6$, and then $C_6H_{12}O_6=2CO_2+2C_2H_6O$. From the fermented fluids, the officinal spirit is obtained by distillation and rectification. The strength of the spirit is shown by its density.

SPIRITUS TENUIOR—PROOF SPIRIT.—*Take of rectified spirit, 5 pints; distilled water, 3 pints, Mix. Specific gravity,* 0·920.

*Therapeutics.*—Rectified and proof spirit are employed in many pharmaceutical processes. Rectified spirit is employed externally for several purposes, as in the preparation of evaporating lotions, as an application to inflamed surfaces, to skin diseases, to prevent bed sores, &c. In the form of ardent spirits (brandy, whisky, &c.), it is given internally as a vital stimulant in many cases.

**Spiritus Vini Gallici**—Spirit of French Wine — Brandy Spirit distilled from French Wine. It has a peculiar flavour, and a light sherry colour.

*Therapeutics.*—Brandy contains about 53 per cent. of alcohol, with some volatile oil and œnanthic ether. It is coloured either by the cask in keeping, or with burnt sugar, being almost colourless when distilled.

It is a powerful and agreeable stimulant and restorative, administered in the adynamic stages of continued fevers, and in other low states of the system. It is employed in the preparation of the Mistura Spiritus Vini Gallici.

**Mistura Spiritus Vini Gallici**—Mixture of Spirit of French Wine. Egg Flip.

PREPARATION.—*Take of spirit of French wine, cinnamon water, of each, 4 fluid ounces; the yolks of two eggs; refined sugar, ½ ounce. Rub the yolks and sugar together, then add the cinnamon water and spirit.*

*Dose.*—One to two fluid ounces.

*Therapeutics.*—This preparation is an excellent stimulant, nutrient, and restorative; very useful, and generally employed both to keep up the circulation and maintain nutrition in low states of the system, as in typhus and typhoid fever, &c. It is popularly termed "egg flip."

**Vinum Xericum**—Sherry.—A Spanish wine.

*Characters.*—Pale yellowish brown, containing about seventeen or eighteen per cent. of alcohol.

Sherry is employed in the preparation of all the officinal wines except three. The exceptions are—Vinum Aurantii, Vinum Ferri Citratis, and Vinum Quiniæ.

ALCOHOL AMYLICUM—AMYLIC ALCOHOL — **Fusel Oil.**—Amylic Alcohol ($C_5H_{12}O$), with a small proportion of other spirituous substances.

An oily liquid, contained in the crude spirit produced by the fermentation of saccharine solutions with yeast, and separated in the rectification or distillation of such crude spirit.

*Characters.*—A colourless liquid, with a penetrating and oppressive odour, and a burning taste. When pure, its specific gravity is ·818, and its boiling point 270°. Sparingly soluble in water, but soluble in all proportions in alcohol, ether, and essential oils. Exposed to the air in contact with platinum-black, it is slowly oxidised, yielding valerianic acid.

Fusel oil, or oil of grain, being less volatile than pure spirit, is left behind in the process of distillation, after the spirit has been drawn off; it may be obtained from the residual liquor by continuing the distillation. As stated in the Pharmacopœia, it is converted by oxidation into valerianic acid, for which purpose it is used in the preparation of the valerianate of soda.

AMYL NITRIS—NITRITE OF AMYL ($C_5H_{11}NO_2$).—Produced by the action of nitric or nitrous acid on amylic alcohol.

*Characters.*—An ethereal liquid of a yellowish colour, and peculiar, not disagreeable, odour. Specific gravity, 0·877; boiling point, 205°. Insoluble in water, soluble in rectified spirit in all proportions. If it be added drop by drop to caustic potash, while fused by the application of heat, valerianate of potash will be formed.

*Dose.*—By inhalation, the vapour of two to five minims. To be used with caution.

*Therapeutics.*—The nitrite of amyl was discovered by Balard, but attention to its property of causing flushing of the face, throbbing of the carotids, and acceleration of the action of the heart was first called by Guthrie in 1859. He recommended it as a resuscitative in drowning, suffocation, and protracted fainting. It was further investigated by Dr. B. W. Richardson, and determined by him to act as a paralyser of the nerves from the periphery inwards, whilst it dilated capillaries and lessened muscular contractility. Dr. Gamgee next showed that it markedly lessened the amount of arterial tension both in man and animals. It is, however, to Dr. T. L. Brunton we are most indebted for what we know of the exact nature of the physiological action, as well as of the therapeutical adaptations, of this remedy. According to Brunton's investigations, the nitrite diminishes the vascular tension, not by weakening the action of the heart, but by lessening the arterial resistance. In doing so, it exerts its action directly upon the vessels themselves, and not through the vaso-motor nerve centres. Whether this effect is produced by a direct action upon the arterial muscular fibres themselves, or through their terminal nerves, Dr. Brunton considers uncertain.

When inhaled, the nitrite of amyl is found to increase the rate of the pulse, within a few seconds doubling, or even more than doubling, its ordinary rate. The face is found to flush, and the carotids to throb, whilst the heart's action feels both quickened and intensified. There is also a peculiar tingling feeling perceptible over the whole surface of the body. If the remedy be persisted in long, convulsions follow. These seem essentially due to suffocation, the nitrite of amyl, in common with other nitrites, possessing the power, as pointed out by Dr. Gamgee, of preventing the hæmoglobin from parting with its oxygen to the economy. Dr. Brunton refers to one case in which slight convulsions followed the inhalation of the nitrite of amyl in the human subject; but when administered in poisonous doses to the lower animals, convulsions come on readily.

The nitrite has been found useful by Brunton and others in alleviating the excruciating pains accompanying angina pectoris when this is associated with increased vascular tension—viz., in such cases as show a tendency to plethora, and are benefited by repeated small bleedings; also in those cases of thoracic aneurism in which recurrent paroxysms of pain and dyspnœa, with intervals of comparative comfort, warrant us in referring the troublesome symptoms to intermittent increase of vascular tension. It has also been recommended in spasmodic asthma, and has been tried, but found wanting, in the collapse stage of cholera. Drs. Hayden and Cruise, of Dublin, tried the nitrite of amyl pretty extensively in this disease, but found that, though it heightened in some degree the colour and surface temperature when inhaled for a few minutes, it had always to be stopped on account of the embarrassment to the respiration which it occasioned. Dr. Brunton regards its failure in giving permanent relief in cholera as due to its preventing the oxidation of the blood in the lungs, and recommends that it be administered by mouth or subcutaneously in this disease. So administered, on theoretical grounds he reasons that it might be expected to be beneficial. In the *Centralblatt für Med. Wissensch.*, No. 44, 1873, Brunton relates an interesting experiment, in which he shows that on immersing a frog, to which a poisonous dose of strychnia had been administered, the moment tetanus comes on, in an atmosphere of nitrite of amyl, there results paralysis of the motor nerves. Thus, by the cotemporaneous action of two medicines of opposing actions, an altered result, analogous to what Drs. Crum Brown and Fraser obtained from chemical combination, is effected.

The tendency of nitrite of amyl to produce a disagreeable fulness in the head renders it inapplicable to many cases in which it would otherwise be expected to afford relief. Its effects are only of a temporary character, and it must always be administered with great caution. The ordinary method is to inhale one or two drops from a piece of blotting-paper folded in the shape of a cone, and placed over the patient's nose. By this method a much smaller amount of the medicine is found effective than when it is dropped upon a towel and then inhaled.

**Æther**—Ether—Æther Sulphuricus.—A volatile liquid prepared from Alcohol, and containing not less than 92 per cent. by volume of pure ether ($C_4H_{10}O$).

PREPARATION.—*Take of rectified spirit*, 50 *fluid ounces; sulphuric acid*, 10 *fluid ounces; chloride of calcium*, 10 *ounces; slaked lime*, ½ *ounce; distilled water*, 13 *fluid ounces. Mix the sulphuric acid with twelve fluid ounces of the spirit in a glass matrass capable of containing at least two pints, and, not allowing the mixture to cool, connect the matrass by means of a bent glass tube with a Liebig's condenser, and distil with a heat sufficient to maintain the liquid in brisk ebullition. As soon as the ethereal fluid begins to pass over, supply fresh spirit through a tube into the matrass in a continuous stream, and in such quantity as to equal the volume of the fluid which distils over. For this purpose use a tube furnished with a stop-cork to regulate the supply, connecting one end of the tube with a vessel containing the spirit raised above the level of the matrass, and passing the other end through a cork fitted into the matrass. When the whole of the spirit has been added, and forty-two fluid ounces have distilled over, the process may be stopped. Dissolve the chloride of calcium in the water, add the lime, and agitate the mixture in a bottle with the impure ether. Leave the mixture at rest for ten minutes, pour off the light supernatant fluid, and distil it with a gentle heat until a glass bead, of specific gravity* 0·735, *placed in the receiver, begins to float. The ether and spirit retained by the chloride of calcium and by the residue of each rectification may be recovered by distillation, and used in a subsequent operation.*

*Characters.*—A colourless, very volatile and inflammable liquid, emitting a strong and characteristic odour, and boiling below 105°. Specific gravity, 0·735. Fifty measures agitated with an equal volume of water are reduced to forty-five by an absorption of ten per cent. It evaporates without residue.

SPIRITUS ÆTHERIS—SPIRIT OF ETHER.—*Take of ether*, 10 *fluid ounces; rectified spirit*, 1 *pint. Mix. Specific gravity*, 0·809.

*Dose.*—Of ether, twenty minims to one fluid drachm ; of the spirit, thirty minims to two fluid drachms.

*Therapeutics.*—Ether acts as a powerful but transient diffusible stimulant. It is usually given in spasmodic and nervous cases, and in those in which it is necessary to arouse the vital energies promptly. It was formerly commonly used as a general anæsthetic, and is still so employed to a considerable extent in the United States of America, but in this country it has been greatly superseded by chloroform for that purpose. Compared with chloroform, it does not induce anæsthesia so speedily, and requires a larger quantity, and hence is not so suitable as chloroform if the case is urgent and time is precious, or in action where it is advisable to use an anæsthetic which acts promptly and less of which is sufficient, and is therefore more easily carried. When applied externally, in consequence of its rapid evaporation, it produces intense cold, a property which Dr. Richardson has turned to advantage in the employment of ether spray as a local anæsthetic. When its evaporation is prevented by a covering, it acts as a rubefacient. Ether is employed as a solvent in several of the officinal preparations.

ÆTHER PURUS—PURE ETHER.—Ether ($C_4H_{10}O$), free from alcohol and water.

PREPARATION.—*Take of ether, distilled water, of each,* 2 *pints; lime, recently burned,* ½ *ounce; chloride of calcium,* 4 *ounces. Put the ether with one pint of the water into a bottle, and shake them together; allow them to remain at rest for a few minutes, and when the two liquids have separated, decant off the supernatant ether; mix this with the remainder of the water, and again, after separation, decant as before. Put now the washed ether, together with the lime and chloride of calcium, into a retort to which a receiver is closely attached ; let them stand for twenty-fours hours, then distil with the aid of a gentle heat. Its specific gravity should not exceed* 0·720.

In this process the water washes out the alcohol, and that part of the water which is taken up by the ether is subsequently removed by the lime and chloride of calcium. Pure ether is used only as a test, and in the preparation of aconitia, and some other alkaloids.

ÆTHER ACETICUS—ACETIC ETHER ($C_2H_5C_2H_3O_2$)—May be obtained by distilling a mixture of eight parts of dry acetate of soda, five parts of rectified spirit, and ten parts of sulphuric acid ; adding the distilled product to half its weight of chloride of calcium in a stoppered bottle ; letting them remain together for twenty-four hours, and then decanting and rectifying the ethereal liquid.

*Characters.*—A colourless liquid, with an agreeable ethereal odour. Specific gravity, 0·910. Boiling point, 166°. Soluble in all proportions in rectified spirit and in ether. One part dissolves in eleven or twelve parts of water at 90°.

*Dose.*—Twenty to sixty minims.

As acetic ether contributes part of the characteristic flavours to wine and vinegar, it will be a suitable addition to stimulants and antispasmodics.

SPIRITUS ÆTHERIS NITROSI—SPIRIT OF NITROUS ETHER—Sweet Spirits of Nitre. A spirituous solution containing nitrous ether ($C_2H_5NO_2$).

PREPARATION.—*Take of nitric acid, 3 fluid ounces; sulphuric acid, 2 fluid ounces; copper, in fine wire (about No. 25), 2 ounces; rectified spirit, a sufficiency. To one pint of the spirit add gradually the sulphuric acid, stirring them together; then add, in the same way, two and a-half fluid ounces of the nitric acid. Put the mixture into a retort or other suitable apparatus, into which the copper has been introduced, and to which a thermometer is fitted. Attach now an efficient condenser, and applying a gentle heat, let the spirit distil at a temperature commencing at* 170° *and rising to* 175°, *but not exceeding* 180°, *until twelve fluid ounces have passed over and been collected in a bottle kept cool, if necessary, with ice-cold water; then withdraw the heat, and having allowed the contents of the retort to cool, introduce the remaining half-ounce of nitric acid, and resume the distillation as before, until the distilled product has been increased to fifteen fluid ounces. Mix this with two pints of the rectified spirit, or as much as will make the product correspond to the tests of specific gravity and percentage of ether separated by chloride of calcium. Preserve it in well-closed vessels.*

*Characters.*—Transparent and nearly colourless, with a very slight tinge of yellow, mobile, inflammable, of a peculiar penetrating apple-like odour, and sweetish cooling sharp taste. When agitated with solution of sulphate of iron and a few drops of sulphuric acid it becomes deep olive-brown or black. Specific gravity, 0·845. It effervesces feebly, or not at all, when shaken with a little bicarbonate of soda. If it be agitated with twice its volume of saturated solution of chloride of calcium in a closed tube, two per cent. of its original volume will separate in the form of nitrous ether, and rise to the surface of the mixture.

*Dose.*—One-half to two fluid drachms.

*Therapeutics.*—Spirit of nitrous ether acts as a diuretic, diaphoretic, and refrigerant. As a diuretic it is given, in combination with other remedies of a similar tendency, in dropsies both general and local; but as it is a stimulant diuretic, it is contra-indicated in acute nephritis. As a refrigerant and diaphoretic it is given with solution of acetate of ammonia in febrile cases.

## Chloroformum—Chloroform ($CHCl_3$).

PREPARATION.—*Take of chlorinated lime,* 10 *pounds; rectified spirit,* 30 *fluid ounces; slaked lime, a sufficiency; water,* 3 *gallons; sulphuric acid, a sufficiency; chloride of calcium, in small fragments,* 2 *ounces; distilled water,* 9 *fluid ounces. Place the water and the spirit in a capacious still, and raise the mixture to a temperature of* 100°. *Add the chlorinated lime and five pounds of the slaked lime, mixing thoroughly. Connect the still with a condensing worm encompassed by cold water, and terminating in a narrow-necked receiver; and apply heat so as to cause distillation, taking care to withdraw the fire the moment that the process is well established. When the distilled product measures fifty ounces, the receiver is to be withdrawn. Pour its contents into a gallon bottle half filled with water, mix well by shaking, and set at rest for a few minutes, when the mixture will separate into two strata of different densities. Let the lower stratum, which constitutes crude chloroform, be washed by agitating it in a bottle with three ounces of the distilled water. Allow the chloroform to subside, withdraw the water, and repeat the washing with the rest of the distilled water in successive quantities of three ounces at a time. Agitate the washed chloroform for five minutes in a bottle with an equal volume of sulphuric acid, allow the mixture to settle, and transfer the upper stratum of liquid to a flask containing the chloride of calcium mixed with half-an-ounce of slaked lime, which should be perfectly dry. Mix well by agitation. After the lapse of an hour, connect the flask with a Liebig's condenser, and distil over the pure chloroform by means of a water-bath. Preserve the product in a cool place, in a bottle furnished with an accurately ground stopper.*

*The lighter liquid which floats on the crude chloroform after its agitation with water and the washings with distilled water should be preserved, and employed in a subsequent operation.*

*Characters.*—A limpid colourless liquid, of an agreeable ethereal odour and sweet taste. Dissolves in alcohol and ether in all proportions, and slightly in water, communicating to it a sweetish taste. Burns, though not readily, with a green and smoky flame. Specific gravity, 1·49. It is not coloured by agitation with sulphuric acid, leaves no residue and no unpleasant odour after evaporation.

AQUA CHLOROFORMI—Chloroform Water.—*Take of chloroform, 1 fluid drachm; distilled water, 25 fluid ounces. Put them into a two-pint stoppered bottle, and shake them together until the chloroform is entirely dissolved in the water. Dose, ℥ss. to ℥ii.*

LINIMENTUM CHLOROFORMI—Liniment of Chloroform.—*Take of chloroform, liniment of camphor, of each, 2 fluid ounces. Mix.*

SPIRITUS CHLOROFORMI—Spirit of Chloroform.—*Take of chloroform, 1 fluid ounce; rectified spirit, 19 fluid ounces. Dissolve. Specific gravity,* 0·871. *Dose, mins.* xx. *to* ʒi.

**Tinctura Chloroformi Composita**—Compound Tincture of Chloroform.

Preparation.—*Take of chloroform, 2 fluid ounces; rectified spirit, 8 fluid ounces; compound tincture of cardamoms, 10 fluid ounces. Mix. Dose, mins.* x. *to* xl.

This is a convenient and agreeable form of administering chloroform internally. It is to be distinguished from the spirit of chloroform, which contains only 1 of chloroform in 20 parts, whereas the present preparation contains 1 of chloroform in 10 parts, and nearly corresponds in strength to the old chloric ether. Spirit of chloroform is the officinal substitute for *Chloric Ether*, which was an uncertain preparation. It has a sweet taste and fragrant odour ; it is given as a stimulant and antispasmodic.

*Therapeutics.*—Chloroform, administered in the fluid form, acts as a sedative and narcotic, producing in over-doses symptoms somewhat resembling those of alcoholic poisoning. When applied externally undiluted, it acts as a counter-irritant, but as an anodyne when diluted. When given in the form of vapour, it acts as an antispasmodic and anæsthetic. It has been recommended internally in cases of neuralgia, in protracted vomiting, in painful and irritable states of the stomach and bowels, in flatulent colic, in lead colic, in spasmodic asthma, in bronchitis and hooping-cough, in hysteria, in delirium tremens, in rheumatism, in tetanus, in dysmenorrhœa, in sea-sickness, &c. &c. As a topical application, it is used to allay neuralgia, toothache, rheumatic and other pains, to allay the itching of certain skin diseases, dropped into the ear to relieve otalgia, &c. As an anæsthetic, it is employed in surgical operations, in midwifery, in convulsions, uræmic, and otherwise, &c. &c. There seems no reason to believe that chloroform adds any danger to a surgical operation in a patient affected with heart disease, with the sole exception perhaps of fatty heart. During labour it ought not to be administered continuously or deeply, but simply during the pains, and suspended for the time as each contraction subsides. It should not be given till nearly the conclusion of the first stage of labour, as there is a risk of it rendering the labour a tedious one. In dentistry practice, in which chloroform has proved most fatal, the untoward results are probably partly due to the necessity of operating in the semi-erect position. But there seems reason to believe that they are also partly referable to the formation of a clot in the larynx, and consequent suffocation. During such operations it is therefore absolutely necessary to see that the throat is kept free of clots; and possibly the best means of avoiding their formation is rapidity of operation, and getting the patient quickly forward so as to clear the mouth. The administration of chloroform is certain to be followed by sickness and vomiting if the patient has partaken of food shortly before commencing its inhalation. But the vomiting is in a great measure preventible by forbidding the patient to take food for four hours previously to the operation; or a little brandy, morphia, or chloral may be given before its administration. Chloroform should never be administered through an inhaler, but simply by means of a handkerchief or towel, which, while it admits free access of air along with the chloroform, permits of being removed the instant it is necessary to suspend the administration; and the patient should be thoroughly under its influence before the surgeon proceeds to operate. Inattention to this rule places the life of the patient in danger, as there is reason to believe that fatal syncope may suddenly occur from reflex irritation from the operator's knife arresting the heart's action. The administrator can readily judge when the patient is sufficiently under its influence, as there is loss of consciousness and sensibility, with complete muscular relaxation and abolition of reflex movement. The best indications of this condition are that the arm drops without resistance when let fall, the conjunctivæ are insensible to irritation, the pupils do not alter in size when exposed to light, and no mechanical irritation excites the least consciousness of pain. If the breathing becomes stertorous, the chloroform should be withdrawn; this symptom, which is due to paresis of the muscles of the palate, is one of danger, showing that too much chloroform has been inhaled. When symptoms of failure of the heart's action or respiration manifest themselves, the chloroform should be instantly withdrawn, and the patient exposed to a current of cold air; artificial respiration should be resorted to, the glottis should be brought forward by hooking forward the base of the tongue with a curved spatula, and tincture of digitalis or solution of atropine should be injected subcutaneously according as a failing heart or respiratory function is the cause of the danger. It cannot be too strongly insisted on that the administrator of chloroform should attend to that and that only, otherwise he cannot pay that attention to the condition of the patient upon which his safety depends. The introduction of chloroform into medical parctice was due to the genius of Sir James Y. Simpson, Bart.; and it may be safely said that, short of the discovery of anæsthesia itself, no greater boon has been bestowed upon suffering humanity in modern times.

**CHLORAL**.—ANHYDROUS CHLORAL.—This substance, which has the composition $C_2HCl_3O$, was discovered as a chemical product by Liebig in 1832, but its valuable therapeutical properties were unknown till discovered by Dr. Otto Liebreich, of Berlin, in 1868. It is most easily prepared by saturating anhydrous alcohol with well-dried chlorine gas, when hydrochloric acid is evolved and chloral formed; thus, $C_2H_6O+Cl_8=C_2HCl_3O+5HCl$. The name chloral was intended to indicate its origin from *chlor*ine and *al*cohol.

*Characters.*—It is a colourless, oily-looking liquid, having a peculiar pungent odour, emitting fumes which cause a flow of tears, and when dropped upon paper it leaves a greasy stain. Applied to the skin, it is caustic. Its boiling point is 210°, and it distils over unchanged. It has no acid reaction, and gives no precipitate with nitrate of silver, but is decomposed by the caustic alkalies into *chloroform* and *formiates* of the alkalies. Its specific gravity is 1·502. It is freely soluble in water, alcohol, and ether. When kept for a few days in dry air, it spontaneously forms a tough, white, porcellaneous-looking mass, which is isomeric with the liquid form, but insoluble in water, alcohol, and ether, and can be reconverted into the liquid form by distillation. Exposed to moist air, or directly mixed with a small quantity of water, it forms

**Chloral Hydras**.—The Hydrate of Chloral, which is permanent in air, is very soluble, and is the form in which chloral is employed in medicine.—Is obtained from anhydrous chloral, prepared as above, on the addition of water.

It has the composition ($C_2HCl_3OH_2O$), and is usually met with in white crystalline masses, but it can also be got both in acicular and rhomboidal crystals, the last having two atoms of water of crystallization. Its specific gravity is 1·57.

*Characters.*—In colourless crystals, which do not deliquesce on exposure to air. It has a pungent but not an acrid odour, and a pungent and rather bitter taste. On the application of a gentle heat it fuses to a colourless transparent liquid, which, as it cools, begins to solidify at a temperature of about 120°. It boils in a test-tube, with pieces of broken glass immersed in it, at about 205°, and at a slightly higher temperature it volatilises on platinum foil without residue. Soluble in less than its own weight of distilled water, rectified spirit, or ether, and in four times its weight of chloroform. The aqueous solution is neutral or but slightly acid to test-paper. A solution in chloroform, when mixed by agitation with sulphuric acid, does not impart colour to the acid. One hundred grains of hydrate of chloral, dissolved in an ounce of distilled water, and mixed with thirty grains of slaked lime, submitted to careful distillation, with a suitable apparatus, should yield not less than seventy grains of chloroform.

SYRUPUS CHLORAL—SYRUP OF CHLORAL.—*Take of hydrate of chloral,* 80 *grains; distilled water,* 4 *fluid drachms; simple syrup, a sufficiency. Dissolve the hydrate of chloral in the water, and add the syrup until the mixed product measures a fluid ounce.*

*Dose.*—Half a fluid drachm to two fluid drachms.

*Therapeutics.*—The therapeutical importance of the hydrate of chloral was first pointed out by Dr. Liebreich, of Berlin, in a paper communicated to the Medical Society of that city in June, 1869. Since that period it has attracted very great attention, and the results of varied and extensive trials with it in different parts of the world have been so very successful, that it must be reckoned as one of the most useful medicines known. Dr. Liebreich having observed that when acted upon by an alkali it was decomposed into chloroform and formic acid, was led to try it medicinally, believing that its chloroform, being gradually set free in small quantity by the alkali in the blood, would thus exert a continuous hypnotic action. But though free alkalies decompose chloral, the alkaline salts which exist in the blood, as proved experimentally by Dr. Arthur Gamgee, do not decompose it; whilst, moreover, the effect of a given amount of chloral is utterly disproportioned to what could be expected from the quantity of chloroform obtainable from it; so that we are forced to confess, in spite of Dr. Richardson's opinion to the contrary, that Dr. Liebreich's theory is untenable, and that chloral must act in a special manner, and not as a simple producer of chloroform. Chloral is a hypnotic and nervous sedative. It is a pure hypnotic, the temperature is reduced and muscular relaxation is complete under its influence. It dilates the cutaneous capillaries and diminishes the respiratory movements, probably due to its action on the respiratory centres and medullæ oblongata. Finally, the heart's action is depressed through paralysis of its intrinsic ganglia. As a hypnotic, it is distinguished by rapidity of action, taking effect in five to thirty minutes. The sleep is usually tranquil and light, with seldom any disagreeable after effects.

Therapeutically, hydrate of chloral is an anæsthetic, hypnotic, sedative, antispasmodic, and antiseptic.

As an *anæsthetic* it is of very little value, the amount of anæsthesia which it produces being both too slight and of too short continuance to warrant its replacing the more powerful and more certain anæsthetics with which we are already acquainted, unless in midwifery, when in a tedious first stage a little chloral is often very soothing.

But as a *hypnotic* it is perhaps the best which we possess, not excepting opium, over which it has the very manifest advantage of being entirely without stimulant action, and of possessing no subsequent bad effects. It is, therefore, specially applicable in such cases as contra-indicate the administration of opium, such as when, from the condition of the patient, opium is positively dangerous, or when it is found to disagree.

Chloral has been successfully employed as a *sedative* and *hypnotic* in puerperal mania, in acute mania, in general paralysis of the insane, and in other forms of insanity; in phthisis (in which case it is found to greatly lessen the night-sweat); in rheumatic fever; in gout; in scarlet fever; in typhus and typhoid fevers; in nervous restlessness and sleeplessness generally; in cardiac diseases, &c.; in tic-douloureux, and in various other forms of neuralgia. It is by far the most trustworthy agent we possess in the treatment of delirium tremens.

As an *antispasmodic*, hydrate of chloral has been employed in epilepsy, in chorea, in uræmic convulsions, in hooping-cough, and in puerperal convulsions, in the latter with especially good results; also in tetanus, and as an antidote to poisoning with strychnia or nux vomica.

As an *antiseptic*, it has only very lately come into use. Five or six grains dissolved in an ounce of water forms an excellent antiseptic lotion. It promises also to be employed as an antiseptic for the purpose of keeping specimens from decaying.

As a sedative simply it may be administered in doses of five to fifteen grains, thrice a-day, and as such it is reported to be very beneficial in periods of mental excitement associated with insanity.

Not a few fatal cases have resulted from the administration of an over-dose of chloral. It is difficult to determine the ordinary fatal dose. The smallest known is fifty grains. There is no doubt but 140 or 150 grains are likely to prove fatal, though much larger doses, even as high as 460 grains, have been administered without alarming results. But the cases in which it has been so given are mostly those of persons accustomed to the excessive use of alcoholic liquors, and in them there seems to exist a power of tolerance of the action of chloral as well as of other narcotics. The symptoms of acute poisoning with it are those of deep coma, great muscular relaxation, apoplectic breathing, flushing of the face, alternating with pallor. Then the breathing becomes less frequent, the jaws fall, the lips become livid, and the extremities cold. Muscular tremors, and even sometimes convulsions, come on. The bronchial surfaces become charged with frothy mucus, which still further impedes the breathing, and death results. The state of the pulse is very variable. But it is usually rapid, weak, and irregular. Treatment should consist in evacuating the contents of the stomach by stomach-pump, if the patient is seen in time, in maintaining a warm atmosphere around him, in employing artificial respiration; whilst the strength is supported by easily assimilated nutrients, such as milk and beef-tea, and by the cautious administration of alcoholic stimulants. Strychnia and atropia have both been recommended as physiological antidotes, and the former at least should be tried. Long continued in medicinal doses, it is liable to induce a train of very annoying and disagreeable symptoms. These differ with different individuals, but the most marked and frequent are—redness and congestion of the conjunctivæ; redness and tenderness of the mouth and fauces; irregularity of the bowels; loss of appetite and a tendency to vomit; various skin eruptions, the most common being urticaria and purplish-red small petechial spots—the latter do not disappear on pressure; marked dyspnœa on slight exertion; weak and irregular action of the heart, with a tendency to faint. With these are combined a tendency to wandering delirium, with much restlessness and insomnia, except under the influence of the drug, which requires to be given in ever-increasing quantity to secure sleep. There are developed also great apathy and want of both the power and the will to attend to duty. Having regard to these facts, the administration of chloral ought to be recommended with great caution in the case of highly nervous patients, and especially when these have been addicted to over-indulgence in alcoholic drinks. The use of chloral by patients without medical supervision ought to be as far as possible prevented. The disagreeable symptoms disappear entirely on suspending the use of the drug. Cannabis Indica and other sedatives may be substituted for it for a time, until the patient acquires the power of sleeping without it. But change of air and scene, with appropriate hygienic and dietetic arrangements, are usually sufficient to enable the patient to break off the habit. It is to be remembered, also, that some fatal cases have resulted from gradual poisoning succeeding the long continued use of this drug in large medicinal doses.

Dr. Richardson, on experimental grounds, is led to the conclusion that an average-sized adult man can only use up about seven grains of chloral per hour, so that when the drug is administered in quantity greater than 140 to 160 grains in twenty-four hours, it is almost certain to lead to more or less speedy poisoning by gradual accumulation in the system.

**Bichloride of Methylene** ($CH_2Cl_2$) (not officinal).—It is a colourless liquid, considerably heavier than water. It has a penetrating odour very like chloroform. It is soluble in water and in alcohol, very soluble in ether; boils at 88°. Its specific gravity is 1·344, of its vapour, 2·937. It has been recommended by Dr. B. W. Richardson as an anæsthetic less liable than chloroform to produce sickness, and more pleasant and possibly safer than chloroform. But experience has shown that chloroform is more agreeable to the patient, and is probably safer, as bichloride of methylene exerts a more powerful paralysing influence on the heart, fatal syncope having occurred in several cases during its administration. Indeed, it seems to possess no advantage over chloroform in any respect, but to be in every way inferior to it; and is, besides, very much more expensive.

*Chlorodyne* (not officinal) has of late been largely used, chiefly as an anodyne, antispasmodic, and soporific—is a dark-coloured liquid of treacly consistence, with a sweet, hot, and peppermint taste. It is supposed by Mr. Squire to contain chloroform, rectified spirit, treacle, extract of liquorice, hydrochlorate of morphia, oil of peppermint, syrup, and prussic acid (two per cent.) Dr. Ogden suggests the following ingredients:—Chloroform, chloric ether, tincture of capsicum, oil of peppermint, hydrochlorate of morphia, hydrocyanic acid (Scheele's), perchloric acid, tincture of Indian hemp, and treacle. The dose is five, ten, or more minims, according to the formula by which it is prepared, and the circumstances of the patient. It is useful in colic, diarrhœa, &c.

**Cerevisiæ Fermentum**.—Beer Yeast.—The ferment obtained in brewing beer. Officinal preparation: *Cataplasma Fermenti.*

*Characters.*—Viscid, semifluid, frothy, exhibiting, under the microscope, numerous round or oval confervoid cells.

CATAPLASMA FERMENTI—Yeast Poultice.—*Take of beer yeast, 6 fluid ounces; flour, 14 ounces; water, heated to* 100°, 6 *fluid ounces. Mix the yeast with the water, and stir in the flour. Place the mass near the fire till it rises.*

*Dose.*—Of yeast, two tablespoonfuls every third hour, with an equal quantity of camphor water or peppermint water.

*Therapeutics.*—Yeast acts as a stimulant and antiseptic, and as such has been recommended in typhus and typhoid fevers, in which it is said to relieve tympanitic distensions, and to remove petechiæ and the blackness of the tongue; it has also been employed in dysentery. The poultice is used as a stimulant and antiseptic application to sloughing parts, ill-conditioned ulcers, recent bruises, &c. It destroys the offensive odour, and promotes the separation of the dead tissues.

**Creasotum**—Creasote ($C_8H_{10}O_2$).—A product of the distillation of Wood Tar. Officinal preparations: *Mistura Creasoti, Unguentum Creasoti, Vapor Creasoti.*

*Characters.*—A liquid, colourless, or with a yellowish tinge, and a strong empyreumatic odour. It is sparingly dissolved by water, but freely by alcohol, ether, and glacial acetic acid. Specific gravity, 1·071. It coagulates albumen.

Creasote may be obtained by the distillation of wood or of wood tar. Pure creasote is colourless and transparent, has a strong empyreumatic odour, and a burning taste. It is inflammable, burning with a sooty flame. It preserves both animal and vegetable tissues. It is distinguished from carbolic acid by having a slightly higher specific gravity; by drying up at 212°, whereas carbolic acid does not boil till 370°; by turning a ray of polarised light to the right, while carbolic acid exerts no effect upon it; and by not being solidified by the cold produced by a mixture of hydrochloric acid and sulphate of soda, whilst carbolic acid is either solid or easily solidifiable by cooling. Creasote frequently contains impurities, and a good deal of the commercial article is said to be in reality carbolic acid.

MISTURA CREASOTI—Creasote Mixture.—*Take of creasote, glacial acetic acid, of each,* 16 *minims; spirit of juniper,* ½ *fluid drachm; syrup,* 1 *fluid ounce; distilled water,* 15 *fluid ounces. Mix the creasote with the acetic acid, gradually add the water, and lastly, the syrup and spirit of juniper. Dose,* ʒi. *to* ʒii.

UNGUENTUM CREASOTI—Ointment of Creasote.—*Take of creasote,* 1 *fluid drachm; simple ointment,* 1 *ounce. Mix thoroughly.*

VAPOR CREASOTI—INHALATION OF CREASOTE.—*Take of creasote, 12 minims; boiling water, 8 fluid ounces. Mix the creasote and water in an apparatus so arranged that air may be made to pass through the solution, and may afterwards be inhaled.*

*Dose.*—Of creasote, one or two drops, cautiously increased to four or five, dissolved in an ounce or more of water (with or without a little acetic acid, as an emulsion with mucilage), or in pill.

*Therapeutics.*—Creasote has been classed with stimulants, sedatives, diuretics, astringents, irritants, rubefacients, caustics, antiseptics, &c. When applied to the tongue, it causes violent pain and a flow of saliva. It coagulates albumen, thereby acting as a caustic, whitening, like nitrate of silver, the surface of a wound. In over-doses it causes nausea, vomiting, vertigo, and profound stupor, with depression of the heart's action. Creasote is given to arrest vomiting, when it occurs from irritability of the stomach or other functional disturbance, without organic lesion; also in the sickness of pregnancy, as a remedy for sea-sickness, &c. It is given also to arrest chronic mucous discharges and slight hæmorrhages. It is applied externally as a styptic. It is applied, either in solution or as the ointment, to ill-conditioned bed-sores, excrescences, condylomata, ulcers, to certain chronic skin diseases, to chilblains, to burns and scalds, &c. It is given internally in diabetes, and, by inhalation, to check excessive expectoration, and to correct fetid breath and sputa, &c. It is also used as a topical application in toothache.

**Acidum Carbolicum**—Carbolic Acid ($HC_6H_5O$).—Phenic Acid—Phenylic Alcohol—Phenylic Acid. Prepared from coal tar oil by fractional distillation and subsequent purification.

*Characters.*—In colourless acicular crystals, which at a temperature of 95° become an oily liquid, having a strong odour and taste, resembling those of creasote, which it also resembles in many of its characters and properties. Its specific gravity, 1·065; boiling point, 370°. The crystals readily absorb moisture on exposure to the air, and they are thus liquefied; the acid, however, is but slightly soluble in water, but is freely soluble in alcohol, ether, and glycerine. It does not redden blue litmus paper.

SUPPOSITORIA ACIDI CARBOLICI CUM SAPONE—CARBOLIC ACID SUPPOSITORIES WITH SOAP.—*Take of carbolic acid, 12 grains; curd soap, 180 grains; starch, in powder, a sufficiency. Mix the carbolic acid with the soap, and add sufficient starch to form a paste of suitable consistence. Divide the mass into twelve equal parts,* *each of which is to be made into a conical or other convenient form for a suppository.*

**Glycerinum Acidi Carbolici**—Glycerine of Carbolic Acid.

PREPARATION.—*Take of carbolic acid,* 1 *ounce; glycerine,* 4 *fluid ounces. Rub them together in a mortar until the acid is dissolved.*

*Dose.*—Of the crystallized acid, one to three grains, thrice a-day, in pill of bread-crumb; of the glycerine, five to fifteen minims, thrice a-day.

*Therapeutics.*—Carbolic acid has, within the last few years, become an article of the first importance, both in the arts and in practical medicine. It is chiefly procured from coal tar, but exists naturally in castoreum, is a product of the distillation of gum of benzoin and of some other resins, is found in small quantities in the urine of man and of some other animals. As powder of lime and coal tar, it was used by the French with great success as an antiseptic dressing for wounds during the Austro-Italian war in 1859. In 1863 Dr. Lemaire of Paris published an octavo volume on Phenylic Acid, in which he discussed Pasteur's germ theory, and maintained that it is the admission of atmospheric germs to wounds, and not the mere accession of air, which occasions suppuration and prevents healing action. He recommended carbolic acid, on antiseptic principles, as an application to scrofulous sores, burns, bites of venomous animals, dissection wounds, sloughing and gangrenous sores, caries, necrosis, abscess of joints, whitlows, carbuncles, lupus, cancerous discharges, otorrhœa, ozæna, &c. &c. Internally, he advised its use in aphtha, croup, angina, dyspepsia, dysentery, cholera; in some contagious diseases, such as scarlet fever and measles; in diseases, such as ague, supposed to be due to the action of malarious poisons. Simultaneously, Dr. Crace Calvert and Dr. Turner of Manchester were investigating its capabilities in England. Dr. Turner communicated a paper to the British Association at their meeting in Manchester in the summer of 1863, in which he advocated its use as an astringent and antiseptic application in cases of putrid discharges from mucous membranes generally, as from the mouth, nostrils, ears, rectum, &c.; as a caustic in diphtheria, carbuncle, fistula, and hæmorrhoids. Dr. James Watson, now of New-chwang, China, made some trials with it in the Edinburgh Infirmary as an antiseptic and parasiticide in 1864, employing it chiefly in favus and in alopecia areata, pointing out at the same time its anti-fermentative and anti-putrescent virtues. During the same year it was recommended by Dr. Wolfe of Glasgow as an astringent and antiseptic inhalation in phthisis and bronchitis.

Guided chiefly by the very marked antiseptic results obtained from carbolic acid in Carlisle during the outbreak of cholera in 1866, Professor Lister was led to employ it as an antiseptic dressing in cases of compound fracture, lacerated wounds, abscesses, &c. He first published the results of his experiments in the *Lancet* in 1867 ; and to him is unquestionably due the credit of introducing carbolic acid into general use in this country, and of instituting the antiseptic treatment of wounds.

Carbolic acid is a *caustic,* if used pure or in strong solution ; an astringent, stimulant, disinfectant, and antiseptic.

As a *caustic,* it has been employed in diphtheria, in carbuncle, in chancre, in the bites of rabid dogs or of venomous animals ; to destroy hæmorrhoids and obliterate fistulous openings ; before the closure of surgical wounds, to destroy any germs that may have attached themselves to the wounded surface during operation.

As a disinfectant and antiseptic it is used in a multitude of cases. To disinfect the sewers of large cities ; to disinfect dissecting rooms ; to oppose the spreading of infectious diseases, such as cholera, typhus and typhoid fever, scarlatina, measles, &c. ; but it is doubtful if it is so useful for these purposes as the mineral acids which destroy the germs of disease, while carbolic acid simply paralyses their power for a time, and does not destroy them. It is also used to maintain a healthy condition of open wounds and promote healing by the first intention, acting, according to Lister, by destroying atmospheric germs, which alighting upon the broken surface, would set up putrefaction ; to prevent the destructive progress of inflammatory action in important organs, as in the cavities of joints, &c. ; to limit the progress of malignant ulcerations, &c. ; to promote the healing of abscesses, both acute and chronic ; to correct putrid conditions of the urine, by being injected into the bladder.

As an astringent, stimulant, and antiseptic, it has been employed in aphthous conditions of the mouth in ozæna, and polypus of the nose ; to correct the fœtor of, and diminish the amount of putrid discharges from the ear, the vagina, or the rectum ; as an injection in gonorrhœa and gleet ; to promote the healing of chancres and putrid sores generally ; also in the treatment of weak and indolent ulcers ; as an inhalation in phthisis and in bronchitis, in gangrene of the lungs, fetid sputa ; in the treatment of many skin diseases, whether or not referable to parasitic origin, as in alopecia areata, tinea favosa, and psoriasis. In putrid ulcerative conditions affecting the rectrum, the suppositories may be employed with advantage. Carbolic acid is also occasionally used as an enema for the destruction of ascarides in the rectum. It ought, however, to be so used with caution, in children especially, as fatal poisoning has resulted from this mode of treatment.

But carbolic acid is also frequently given internally, in the treatment of fevers of a septic nature, as in typhoid fever, in pyæmia, in scarlet fever, &c.; also when the patient suffers from suppurative action, as in abscess. In the treatment of typhoid, when there is much gastric irritability, it is better to administer the sulpho-carbolate than the free acid; but its administration in these cases is not followed by any marked effect, whether given as a prophylactic or as a remedy. The dose of the latter is about thirty grains. Carbolic acid has lately been administered internally for psoriasis, and this practice, so far, seems to have been followed with some success.

As a disinfectant, carbolic acid is much more active than the ordinary disinfectants, such as chloride of zinc and the permanganate of potash; whilst it is, at the same time, volatile, and consequently is much more easily applied, and acts far more generally. Besides, the pure acid has very little, if any, disagreeable smell. Though on the first application to a part carbolic acid is painful, yet after its continuance for some time the acid seems to exert a certain amount of anæsthetic action upon the nerves of the part. During the administration of carbolic acid the patient's urine assumes a dark, smoky-looking character.

Numerous cases of poisoning have occurred, and the symptoms appear in a very short time after its ingestion. Sometimes the rapidity of the fatal result equals that of prussic acid. Thus, in Dr. Taylor's case, the man fell unconscious in ten seconds after 1 ounce of the acid; two minutes afterwards he was totally unconscious, pulseless, with irregular gasping respirations; and in less than one minute later was dead, apparently from cardiac paralysis. Generally the symptoms come on in a few minutes with nausea, cold sweats, stupor deepening rapidly into insensibility, and collapse; only occasionally convulsions. The minimum fatal dose is ℥ss. But fatal cases may follow, and have followed its external application, and a form of chronic poisoning with loss of appetite, weakness, and a tendency to collapse resulting from the continued surgical use of the acid has been described by Dr. Wallace. The treatment of carbolic acid poisoning is not satisfactory, the symptoms being developed so speedily there is little time to prepare even if we possessed an antidote. Emetics are generally useless as the susceptibility of the stomach is benumbed, therefore use the stomach-pump. The recent experiments of Husemann indicate that the alkalies have some power of controlling its action if given in solution, and in excess. Of them lime is probably the best, if given in the form of the saccharate prepared according to Dr. Wood as follows:—"Dissolve 16 parts of sugar in 40 parts of distilled water, and add 5 parts of caustic lime; digest for three days, thinning from time to time, filter and evaporate to dryness." The product thus obtained dissolves easily in water. Olive oil or castor oil may be given to prevent its absorption, and afterwards stimulants to relieve the collapse. Or, according to Baumann, sulphate of sodium, which is a chemical antidote forming a harmless phenol. sulphuric acid, should be given.

# APPENDIX.

## I.

## ARTICLES EMPLOYED IN CHEMICAL TESTING (B.P.)

**Alcohol** (Absolute Alcohol). See page 388.

**Benzol** ($C_6H_6$).—A colourless volatile liquid, obtained from coal tar. Specific gravity, 0·85.

**Boracic Acid** ($H_3BO_3$). *Tests.*—Soluble in Alcohol. The solution burns with a green flame.

**Chloride of Barium** ($BaCl_2,2H_2O$).

**Copper Foil.**—Pure metallic copper, thin and bright.

**Gold, Fine.**—Gold, free from metallic impurities.

**Hyposulphite of Soda** ($Na_2H_2S_2O_44H_2O$). *Test.*—24·8 grains decolorise 100 measures of the volumetric solution of iodine.

**Indigo** ($C_8H_5NO$).—A blue pigment prepared from various species of Indigofera, *Linn.*

**Isinglass.**—The swimming bladder or sound of various species of Acipenser, *Linn.*, prepared and cut into fine shreds.

**Litmus.**—See page 375. A blue pigment prepared from various species of Roccella, *D.C.*

**Litmus Paper, Blue.**—Unsized white paper steeped in tincture of litmus, and dried by exposure to the air.

**Litmus Paper, Red.**—Unsized white paper steeped in tincture of litmus which has been previously reddened by the addition of a very minute quantity of sulphuric acid, and dried by exposure to the air.

**Litmus Tincture.**—Take of litmus, in powder, 1 ounce; proof spirit, 10 fluid ounces. Macerate for two days in a closed vessel, and filter.

**Oxalic Acid of Commerce.**

**Oxalic Acid, Purified** ($H_2C_2O_42H_2O$).—Take of oxalic acid of commerce, 1 pound; boiling distilled water, 30 fluid ounces. Dissolve, filter the solution, and set it aside to crystallize. Pour off the liquor, and dry the crystals by exposure to the air on filtering paper placed on porous bricks. *Test.*—It is entirely dissipated by a heat below 350°.

**Oxalate of Ammonia** ($(NH_4)_2C_2O_4H_2O$).—Take of purified oxalic acid, 1 ounce; boiling distilled water, 8 fluid ounces; carbonate of ammonia, a sufficiency. Dissolve the oxalic acid in the water, neutralise the solution at a boiling temperature, filter it while still hot, and set it by that crystals may form as it cools.

**Plaster of Paris.**—Native sulphate of lime ($CaSO_42H_2O$) deprived of water by heat.

**Platinum Black.**—Platinum in a state of minute division, obtained by adding excess of carbonate of soda and some sugar to solution of perchloride of platinum, and boiling until a black precipitate is formed, which is washed and dried.

**Platinum Foil.**

**Red Prussiate of Potash** ($K_6Fe_2C_{12}N_{12}$). *Test.*—Its solution in water gives no precipitate with persulphate of iron.

**Subacetate of Copper of Commerce.**—Verdigris.

**Sulphate of Copper, Anhydrous** ($CuSO_4$).—Sulphate of copper deprived of its water by a heat of 400°. *Characters.*—A yellowish-white powder, which becomes blue when moistened with water.

**Sulphide of Iron** (FeS).—Produced by applying the end of a rod of iron, heated to a white heat at a blacksmith's forge, to the end of a roll of sulphur, and allowing the sulphide of iron as it is formed to run into a vessel of water.

**Sulphuretted Hydrogen** ($H_2S$).—Take of sulphide of iron, ½ ounce; water, 4 fluid ounces; sulphuric acid, a sufficiency. Place the sulphate of iron and the water in a gas-bottle, closed with a cork perforated by two holes, through one of which passes air-tight a funnel tube of sufficient length to dip into the water, and through the other a tube for giving exit to the gas. Through the former pour from time to time a little of the acid, so as to develop the sulphuretted hydrogen as it may be required.

**Tin, Granulated.**—Grain tin, reduced to small fragments by fusing and pouring into cold water.

**Solution of Chloride of Tin.**—Take of granulated tin, 1 ounce, hydrochloric acid, 3 fluid ounces; distilled water, a sufficiency. Dilute the acid in a flask with one fluid ounce of the water, and, having added the tin, apply a moderate heat until gas ceases to be evolved. Add as much of the water as will make up the bulk to five fluid ounces, and transfer the solution, together with the undissolved tin, to a bottle with an accurately ground stopper.

**Solution of Gelatine.**—Take of isinglass, in shreds, 50 grains; warm distilled water, 5 fluid ounces. Mix and digest for half-an-hour on a water-bath, with repeated shaking, and filter through clean tow moistened with distilled water.

**Solution of Iodate of Potash.**—Take of iodine, 50 grains; chlorate of potash, 50 grains; nitric acid, 8 minims; distilled water, 10½ fluid ounces. Rub the iodine and chlorate of potash together to a fine powder; place the mixture in a Florence flask, and, having poured upon it half-an-ounce of the water acidulated with the nitric acid, digest at a gentle heat until the colour of the iodine disappears. Boil for one minute; then transfer the contents of the flask to a capsule, and evaporate to perfect dryness at 212°. Finally, dissolve the residue in the remaining ten ounces of distilled water; filter the solution, and keep it in a stoppered bottle.

**Solution of Iodide of Potassium.**—Take of iodide of potassium, 1 ounce; distilled water, 10 fluid ounces. Dissolve and filter.

**Solution of Oxalate of Ammonia.**—Take of oxalate of Ammonia, ½ ounce; warm distilled water, 1 pint. Dissolve and filter.

**Solution of Perchloride of Platinum.**—Take of thin platinum foil, ¼ ounce; nitric acid, a sufficiency; hydrochloric acid, a sufficiency; distilled water, 7 fluid ounces. Mix a fluid ounce of the nitric acid with four fluid ounces of the hydrochloric acid and two fluid ounces of the water; pour the mixture into a small flask containing the platinum, and digest at a gentle heat, adding more of the acids, mixed in the same proportion, should this be necessary, until the metal is dissolved. Transfer the solution to a porcelain dish, add to it a fluid drachm of hydrochloric acid, and evaporate on a water-bath until acid vapours cease to be given off. Let the residue be dissolved in the remaining five ounces of distilled water. Filter and preserve it in a stoppered bottle.

**Solution of Phosphate of Soda.**—Take of phosphate of soda, in crystals, 1 ounce ; distilled water, 10 fluid ounces. Dissolve and filter.

**Solution of Red Prussiate of Potash.**—Take of red prussiate of potash, in crystals, ½ ounce ; distilled water, 5 fluid ounces. Dissolve and filter.

**Solution of Sulphate of Indigo.**—Take of Indigo, dry, and in fine powder, 5 grains ; sulphuric acid, 10 fluid ounces. Mix the indigo with a fluid drachm of the sulphuric acid in a small test-tube, and apply the heat of a water-bath for an hour. Pour the blue liquid into the remainder of the acid, agitate the mixture, and, when the undissolved indigo has subsided, decant the clear liquid into a stoppered bottle.

**Solution of Sulphate of Iron.**—Take of granulated sulphate of iron, 10 grains ; boiling distilled water, 1 fluid ounce. Dissolve and filter. This solution should be recently prepared.

**Solution of Sulphate of Lime.**—Take of plaster of Paris, ¼ ounce ; distilled water, 1 pint. Rub the plaster of Paris in a porcelain mortar for a few minutes with two ounces of the water, introduce the mixture thus obtained into a pint bottle containing the rest of the water, shake well several times, and allow the undissolved sulphate to subside. When this has occurred, filter.

**Solution of Sulphide of Ammonium.**—Take of solution of ammonia, 5 fluid ounces. Put three fluid ounces of the ammonia into a bottle, and conduct into this a stream of sulphuretted hydrogen so long as the gas continues to be absorbed ; then add the remainder of the ammonia, and transfer the solution to a green glass bottle furnished with a well-ground stopper.

**Solution of Tartaric Acid.**—Take of tartaric acid, in crystals, 1 ounce ; distilled water, 8 fluid ounces ; rectified spirit, 2 fluid ounces. Dissolve the tartaric acid in the water, add the rectified spirit, and preserve the solution in a stoppered bottle.

**Solution of Yellow Prussiate of Potash.**—Take of yellow prussiate of potash, in crystals, 1 ounce ; distilled water, 5 fluid ounces. Dissolve and filter.

## III.

# TEST SOLUTIONS FOR VOLUMETRIC ESTIMATIONS

## (B.P.)

THE processes for volumetric estimations may be performed either with British or with metrical weights and measures, and the solutions are so arranged that they will be of the same strength, and the same indications will be obtained in using them, whichever system is employed, without the *necessity* of altering any of the figures by which the quantities of the substances tested, or of the test solutions required in the process, are expressed.

According to the British system, the quantities of the substances to be tested are expressed in grains by weight, whilst the quantities of the test solutions employed in testing are expressed in grain measures —the grain measure being the volume of a grain of distilled water.

According to the metrical system, the quantities of the substances to be tested are expressed in grammes by weight, whilst the quantities of the test solutions employed in testing are expressed in cubic centimetres—the cubic centimetre being the volume of a gramme of distilled water.

As the cubic centimetre bears the same relation to the gramme that the grain measure bears to the grain, the one system may be substituted for the other with no difference in the results, excepting that, by the metrical system, all the quantities will be expressed in relation to a weight (the gramme) which is more than fifteen times as great as the British grain.

In practice it will be found convenient, in substituting metrical for British weights and measures, to reduce the values of all the numbers to one-tenth, by moving the decimal points, and this has been done in the tables appended to the descriptions of the volumetric solutions. The quantities indicated in the Pharmacopœia, which in grains and grain measures can be conveniently used, would be found inconveniently large if the same number of grammes and cubic centimetres were employed.

The following apparatus is required in the preparations and use of these solutions :—

For British weights and measures—

1. A flask which, when filled to a mark on the neck, contains exactly 10,000 grains of distilled water at 60°. The capacity of the flask is, therefore, 10,000 grain measures.

2. A graduated cylindrical jar which, when filled to 0, holds 10,000 grains of distilled water, and is divided into 100 equal parts.

3. A burette. A graduated glass tube which, when filled to 0, holds 1000 grains of distilled water, and is divided into 100 equal parts. Each part, therefore, corresponds to 10 grain measures.

For metrical weights and measures—

1. A glass flask which, when filled to a mark on the neck, contains one litre, or 1000 cubic centimetres.

2. A graduated cylindrical jar, which, when filled to 0, contains one litre (1000 cubic centimetres), and is divided into 100 equal parts.

3. A burette. A graduated tube, which, when filled to 0, holds 100 cubic centimetres, and is divided into 100 equal parts.

(One cubic centimetre is the volume of one gramme of distilled water at 4°C.* 1000 centimetres equal one litre.)

Volumetric solutions, before being used, should be shaken, in order that they may be throughout of uniform strength. They should also be preserved in stoppered bottles. All measurements should be made at 60°.

**Volumetric Solution of Bichromate of Potash** (Bichromate of Potash, $K_2Cr_2O_7 = 295$).—Take of Bichromate of Potash, 147·5 grains; distilled water, a sufficiency. Put the bichromate of potash into the 10,000 grain flask, and having half-filled the flask with water, allow the salt to dissolve; then dilute the solution with more water, until it has the exact bulk of 10,000 grain measures. 1000 grain measures of this solution contain 14·75 grains of the bichromate ($\frac{1}{20}$th of $K_2Cr_2O_7$, in grains), and when added to a solution of protosalt of iron acidulated with hydrochloric acid are capable of converting 16·8 grains of iron ($\frac{1}{20}$th of 6Fe, in grains) from the state of protosalt to that of persalt.

Grammes and cubic centimetres may be employed instead of grains and grain measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. Thus, 14·75 grammes of bichromate of potash should be made to form 1000 cubic centimetres of solution. 100 cubic centimetres of this solution contain 1·475 grammes of the bichromate ($\frac{1}{200}$th of $K_2Cr_2O_7$, in grammes), and when added to a solution of protosalt of iron acidulated with hydrochloric acid are capable of converting 1·68 grammes of iron ($\frac{1}{200}$th of 6Fe, in grammes) from the state of protosalt to that of persalt.

This solution is used for determining the proportion of protoxide of iron in the following preparations. It is known that the whole of protosalt has been converted into a persalt when a minute drop of the liquid, placed in contact with a drop of the solution of red prussiate of potash on a white plate, ceases to strike with it a blue colour.

---

* It is customary to make the measurements with metrical apparatus at 60° Fahr.

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Ferri Arsenias . | 20 | = | 170 | or | 2·0 | = | 17·0 |
| " Carb. Sach. . | 20 | = | 330 | or | 2·0 | = | 33·0 |
| " Oxid. Magn. . | 20 | = | 83·0 | or | 2·0 | = | 8·3 |
| " Phosphas . | 20 | = | 250 | or | 2·0 | = | 25·0 |

**Volumetric Solution of Hyposulphite of Soda** (Hyposulphite of Soda crystallized ($Na_2H_2S_2O_4 4H_2O = 248$).—Take of hyposulphite of soda, in crystals, 280 grains; distilled water, a sufficiency.

Dissolve the hyposulphite of soda in 10,000 grain measures of water. Fill a burette with this solution, and drop it cautiously into 1000 grain measures of the volumetric solution of iodine, until the brown colour is just discharged. Note the number of grain measures ($n$) required to produce this effect; then put 8000 grain measures of the same solution into a graduated jar, and augment this quantity by the addition of distilled water until it amounts to $\frac{8000 \times 1000}{n}$ grain measures. If, for example, $n = 950$, the 8000 grain measures of solution should be diluted to the bulk of $\frac{8000 \times 1000}{950} = 8421$ grain measures. 1000 grain measures of this solution contain 24·8 grains of the hyposulphite ($\frac{1}{10}$th of $Na_2H_2S_2O_4 4H_2O$, in grains), and therefore correspond to 12·7 grains of iodine ($\frac{1}{10}$th of an equivalent).

Grammes and cubic centimetres may be employed instead of grains and grain measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres of this solution contain 2·48 grammes of the hyposulphite ($\frac{1}{100}$th of $Na_2H_2S_2O_4 4H_2O$, in grammes), and therefore correspond to 1·27 grains of iodine ($\frac{1}{100}$th of an equivalent).

This solution is used for testing the following substances. In each case, excepting that of iodum, a solution of iodide of potassium and hydrochloric acid are added to the substance, and the amount of iodine so liberated is indicated by this solution.

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Calx Chlorata | 10·0 | = | 850 | or | 1·00 | = | 85·0 |
| Iodum | 12·7 | = | 1000 | or | 1·27 | = | 100·0 |
| Liq. Calc. Chloratæ | 60·0 | = | 500 | or | 6·00 | = | 50·0 |
| „ Chlori | 439·0 | = | 750 | or | 43·90 | = | 75·0 |
| „ Sodæ Chloratæ | 70·0 | = | 500 | or | 7·00 | = | 50·0 |

**Volumetric Solution of Iodine** (Iodine, I=127).—Take of iodine, 127 grains; iodide of potassium, 180 grains; distilled water, a sufficiency. Put the iodide of potassium and the iodine into the 10,000 grain flask, fill the flask to about two-thirds its bulk with distilled water, gently agitate until solution is complete, and then dilute the solution with more water until it has the exact volume of 10,000 grain measures. 1000 grain measures of this solution contain $\frac{1}{10}$th of an equivalent in grains (12·7 grains) of iodine, and therefore correspond to 1·7 grains of sulphuretted hydrogen, 3·2 grains of sulphurous, and 4·95 grains of arsenious acid.

Grammes and cubic centimetres may be employed instead of grains and grain measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimeters contain 1·27 grammes of iodine, and correspond to 0·17 grammes of sulphuretted hydrogen, 0·32 grammes of sulphurous, and 0·495 grammes of arsenious acid.

This solution is used for testing the following substances. It is dropped from the burette into the liquid to be tested until free iodine begins to appear in the solution.

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Acid. Arseniosum | 4·0 | = | 808 | or | 0·40 | = | 80·8 |
| „ Sulphurosum | 34·7 | = | 1000 | or | 3·47 | = | 100·0 |
| Liquor Arsenicalis | 441·5 | = | 808 | or | 44·15 | = | 80·8 |
| „ Arsenici Hydrochloricus. | 441·5 | = | 810 | or | 44·15 | = | 81·0 |

**Volumetric Solution of Nitrate of Silver** (Nitrate of Silver, $AgNO_3$=170).—Take of nitrate of silver, 170 grains; distilled water, a sufficiency. Put the nitrate of silver into the 10,000 grain flask, and, having half-filled the flask with water, allow the salt to dissolve;

then dilute the solution with more water until it has the exact bulk of 10,000 grain measures. The solution should be kept in an opaque stoppered bottle. 1000 grain measures of this solution contain $\frac{1}{10}$th of an equivalent in grains of nitrate of silver (or 17·0 grains).

Grammes and cubic centimetres may be employed instead of grains and grain measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{100}$th of an equivalent in grammes of nitrate of silver (or 1·7 grammes).

It is used in testing the following substances :—

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Acid. Hydrocyan. . | 270 | = | 1000 | or | 27·0 | = | 100·0 |
| Potass. Bromid. . | 10 | = | 840 | or | 1·0 | = | 84·0 |
| Sodæ Arsenias (dry) . | 10 | = | 1613 | or | 1·0 | = | 161·3 |

**Volumetric Solution of Oxalic Acid** (Crystallized Oxalic Acid, $H_2C_2O_42H_2O=126$).—Take of purified oxalic acid, in crystals, quite dry, but not effloresced, 630 grains ; distilled water, a sufficiency.

Put the oxalic acid into the 10,000 grain flask, fill the flask to about two-thirds of its bulk with water, allow the acid to dissolve, and then dilute the solution with more water, until it has the exact volume of 10,000 grain measures. 1000 grain measures of this solution contain half an equivalent in grains (63 grains) of oxalic acid, and are therefore capable of neutralising one equivalent in grains of an alkali or alkaline carbonate.

Grammes and cubic centimetres may be employed instead of grains and grain measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{20}$th of an equivalent in grammes (6·3 grammes) of oxalic acid, and will neutralise $\frac{1}{10}$th of an equivalent in grammes of an alkali.

The following substances are tested with this solution :—

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Ammoniæ Carb. . | 59·0 | = | 1000 | or | 5·90 | = | 100·0 |
| Borax . . . | 191·0 | = | 1800 | or | 19·10 | = | 100·0 |
| Liq. Ammon. . . | 85·0 | = | 500 | or | 8·50 | = | 50·0 |
| " " Fort. . | 52·3 | = | 1000 | or | 5·23 | = | 100·0 |

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Liq. Calcis . | 4380·0 | = | 200 | or | 438·00 | = | 20·0 |
| „ „ Sacchar. . | 46·0 | = | 254 | or | 46·02 | = | 25·4 |
| „ Plumbi Subacet. | 413·3 | = | 810 | or | 41·33 | = | 81·0 |
| „ Potassæ . . | 462·9 | = | 482 | or | 46·29 | = | 48·2 |
| „ „ efferves. | 4380·0 | = | 150 | or | 438·00 | = | 15·0 |
| „ Sodæ „ . | 458·0 | = | 470 | or | 45·80 | = | 47·0 |
| „ „ efferves. | 4380·0 | = | 178 | or | 438·00 | = | 17·8 |
| Plumbi Acetas . . | 38·0 | = | 200 | or | 3·80 | = | 20·0 |
| Potassa Caustica . | 56·0 | = | 900 | or | 5·60 | = | 90·0 |
| Potassæ Bicarb. . | 50·0 | = | 500 | or | 5·00 | = | 50·0 |
| „ Carb. . . | 83·0 | = | 980 | or | 8·30 | = | 98·0 |
| „ Citras . . | 102·0 | = | 1000 | or | 10·20 | = | 100·0 |
| „ Tartaras . | 113·0 | = | 1000 | or | 11·30 | = | 100·0 |
| „ „ Acida | 188·0 | = | 1000 | or | 18·80 | = | 100·0 |
| Soda Caustica . . | 40·0 | = | 900 | or | 4·00 | = | 90·0 |
| „ Tartarata . . | 141·0 | = | 1000 | or | 14·10 | = | 100·0 |
| Sodæ Bicarb. . . | 84·0 | = | 1000 | or | 8·40 | = | 100·0 |
| „ Carb. . . | 143·0 | = | 960 | or | 14·30 | = | 96·0 |

**Volumetric Solution of Soda** (Hydrate of Soda, $NaHO = 40$).—Take of solution of soda, a sufficiency; distilled water, a sufficiency.

Fill a burette with the solution of soda, and cautiously drop this into 63 grains of purified oxalic acid, dissolved in about two ounces of water, until the acid is exactly neutralised as indicated by litmus. Note the number of grain measures ($n$) of the solution used, and having then introduced 9000 grain measures of the solution of soda into a graduated jar, augment this quantity by the addition of water, until it becomes $\frac{9000 \times 1000}{n}$ grain measures. If, for example, $n = 930$, the 9000 grain measures should be augmented to $\frac{9000 \times 1000}{930} = 9677$ grain measures. 1000 grain measures of this solution contain one equivalent in grains (40 grains) of hydrate of soda, and will therefore neutralise one equivalent in grains of any monobasic acid.

Grammes and cubic centimetres may be employed instead of grains and grain measures, but for convenience $\frac{1}{10}$th of the numbers should be taken. 100 cubic centimetres contain $\frac{1}{10}$th of an equivalent in grammes (4 grammes) of hydrate of soda, and will neutralise $\frac{1}{10}$th of an equivalent in grammes of an acid.

This solution is used for testing the following substances :—

| | British weights and measures. | | | | Metrical weights and measures. | | |
|---|---|---|---|---|---|---|---|
| | Grains weight of Substance. | = | Grain measures of Vol. Sol. | or | Grams. wt. of Substance. | = | C. C. of Vol. Sol. |
| Acetum . . . | 445·4 | = | 402 | or | 44·54 | = | 40·2 |
| Acid. Acet. . . | 182·0 | = | 1000 | or | 18·20 | = | 100·0 |
| „ „ Dil. . . | 440·0 | = | 313 | or | 44·00 | = | 31·3 |
| „ „ Glac. . | 60·0 | = | 990 | or | 6·00 | = | 99·0 |
| „ Citric . . | 70·0 | = | 1000 | or | 7·00 | = | 100·0 |
| „ Hydrochl. . | 114·8 | = | 1000 | or | 11·48 | = | 100·0 |
| „ „ Dil. . | 345·0 | = | 1000 | or | 34·50 | = | 100·0 |
| „ Nitric. . . | 90·0 | = | 1000 | or | 9·00 | = | 100·0 |
| „ „ Dil. . | 361·3 | = | 1000 | or | 36·13 | = | 100·0 |
| „ Nitro-Hydroc.Dil. | 352·4 | = | 920 | or | 35·24 | = | 92·0 |
| „ Sulph. . . | 50·6 | = | 1000 | or | 5·06 | = | 100·0 |
| „ „ Arom. . | 304·2 | = | 830 | or | 30·42 | = | 83·0 |
| „ „ Dil. . | 359·0 | = | 1000 | or | 35·90 | = | 100·0 |
| „ Tartaricum . . | 75·0 | = | 1000 | or | 7·50 | = | 100·0 |

## SYMBOLS AND EQUIVALENT WEIGHTS OF THE ELEMENTARY BODIES MENTIONED IN THE BRITISH PHARMACOPŒIA.

| Elementary Bodies. | Symbols. | Equivalents. | |
|---|---|---|---|
| | | Old System. | New System. |
| Aluminium | Al | 13·75 | 27·5 |
| Antimony (Stibium) | Sb | 122 | 122 |
| Arsenic | As | 75 | 75 |
| Barium | Ba | 68·5 | 137 |
| Bismuth | Bi | 210 | 210 |
| Boron | B | 11 | 11 |
| Bromine | Br | 80 | 80 |
| Cadmium | Cd | 56 | 112 |
| Calcium | Ca | 20 | 40 |
| Carbon | C | 6 | 12 |
| Cerium | Ce | 46 | 92 |
| Chlorine | Cl | 35·5 | 35·5 |
| Chromium | Cr | 26·25 | 52·5 |
| Copper (Cuprum) | Cu | 31·75 | 63·5 |
| Gold (Aurum) | Au | 196·5 | 196·5 |
| Hydrogen | H | 1 | 1 |
| Iodine | I | 127 | 127 |
| Iron (Ferrum) | Fe | 28 | 56 |
| Lead (Plumbum) | Pb | 103·5 | 207 |
| Lithium | L | 7 | 7 |
| Magnesium | Mg | 12 | 24 |
| Manganese | Mn | 27·5 | 55 |
| Mercury (Hydrargyrum) | Hg | 100 | 200 |
| Nitrogen | N | 14 | 14 |
| Oxygen | O | 8 | 16 |
| Phosphorus | P | 31 | 31 |
| Platinum | Pt | 98·5 | 197 |
| Potassium (Kalium) | K | 39 | 39 |
| Silver (Argentum) | Ag | 108 | 108 |
| Sodium (Natrium) | Na | 23 | 23 |
| Sulphur | S | 16 | 32 |
| Tin (Stannum) | Sn | 59 | 118 |
| Zinc | Zn | 32·5 | 65 |

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